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ROHR INC

Contractor

ENVIROLOGIC DATA INC

Document Title

ASSESSMENT OF RISKS FROM POTENTIAL EXPOSURE TO AIRBOURNE FACILITY EMISSIONS UNDER CALIFORNIA AB 2588 FOR THE ROHR INC FACILITY RIVERSIDE, CALIF (VOL. 1) (FINAL REPORT) W-LETTER

Chemical Category

PERCHLORETHYLENE (127-18-9)

CONTAINS NO CBI

ROHR, INC.

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July 27, 1992

8692001012

86920001002

Document Processing Center (TS-790)
Room L-100
Office of Toxic Substances
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

VIA: Courier

ATTENTION: 8(d) Health and Safety Reporting Rule (Notification/ Reporting)

Dear Sir or Madame:

Pursuant to TSCA Section 8(d) and 40 CFR 716, Rohr, Inc. is submitting the enclosed final study on the following list of chemicals:

- Percloroethylene
  CAS #127-18-9
- Ethylene Oxide
  CAS #75-21-8
- Methylene Chloride
  CAS #75-09-2
- Propylene Oxide
  CAS #75-56-9
- Ethylene Dichloride
  CAS #107-06-2
- Toluene
  CAS #108-88-3
- Methyl Chloroform
  CAS #71-55-6

- o Phenol
  CAS #108-95-2

- o 4,4'- Diphenylmethane diisocyanate (aka: Benzene, 1,1' -methylenebis[4-isocyanato-], methylenebis(phenylisocyanate), MDI)
  CAS #101-68-8

- o Ethanol, 2-butoxy-
  CAS #111-76-2

- o Cyclohexane, 1,1' -methylenebis[4-isocyanato-
  CAS #5124-30-1

- o Hexane, 1,6-diisocyanato- (aka: 1,6- Hexamethylene diisocyanate)
  CAS #822-06-0

- o Ethane, 1,1,2-tricloro- 1,2,2 trifluoro- (aka: Freon 113, Chlorinated fluorocarbon)
  CAS #76-13-1

We are submitting this study to EPA under TSCA Section 8(d). We understand that this submission will satisfy any obligations we may have to report under TSCA Section 8(e) because it is submitted within the 15 day time frame required under TSCA Section 8(e). Our understanding is based on EPA's June 1991 TSCA Section 8(e) Reporting Guide on page 10. Please call us immediately if our understanding is not correct.

We notified EPA of the initiation of the study by letter dated August 6, 1992. At that time, we provide a list of two chemicals: methylene chloride (CAS #75-09-2) and ethylene dichloride (CAS #107-06-2) which were to be included in the refined risk assessment. The selection of these chemicals occurred by using EPA method Upon review of the risk assessment protocol, South Coast Air Quality Management District (SCAQMD) stated that the screening process was inadequate and mandated that Rohr use their guidelines. In the process of using SCAQMD screening method, additional eleven (11) TSCA Section 8(d) chemicals were added to the refined risk assessment. We were unaware of the additional chemicals until receipt of the final study.

The final study is a risk assessment of specific chemicals and the potential health risk to the public and occupational community based on air emissions of these chemicals.

Please note, that background information (Volume II) is available upon request. Should you have questions or need clarification, please do not hesitate to contact:

Diane K. Kenney, CIH
Manager, Corporate Safety and Health
Rohr, Inc.
P.O. Box 878 MZ 873
Chula Vista, California 92912
(619) 691- 6693

Sincerely,

R. William Difley
Vice President, Human Resources
(619) 691- 2048

attachment
enclosure
rwd/dkk

Attachment I:
TSCA Section 8(d) Studies

Section 8(d) Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Percloroethylene (CAS #127-18-9).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

R. William Difiey
Vice President, Human Resources
Rohr, Inc.
P.O. Box 878 MZ 15
Chula Vista, Ca. 91912
(619) 691-2048

Manufacturing Facility for Submittal:

Rohr, Inc.
8200 Arlington Avenue
Riverside, California 92503-1499

Attachment II.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Ethylene Oxide (CAS #75-21-8).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment III.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methylene Chloride (CAS #75-09-2).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment IV.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Propylene Oxide (CAS #75-56-9).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment V.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Toluene (CAS # 108-88-3).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment VI.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Ethylene Dichloride (CAS #107-06-2).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment VII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Methyl Chloroform (CAS #71-55-6).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment VIII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Phenol (CAS #108-95-2).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment IX.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on 4,4'- Diphenylmethane diisocyanate (aka: Benzene, 1,1' methylenebis[4-isocyanato-], methylenebis(phenylisocyanate), MDI) (CAS #101-68-8).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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8200 Arlington Avenue
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Attachment X.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Ethanol, 2-butoxy- (CAS #111-76-2).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Manufacturing Facility for Submittal:

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8200 Arlington Avenue
Riverside, California 92503-1499

Attachment XI.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Cyclohexane, 1,1' -methylenebis[4-isocyanato- (CAS #5124-30-1).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

R. William Difley
Vice President, Human Resources
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8200 Arlington Avenue
Riverside, California 92503-1499

Attachment XII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Hexane, 1,6-diisocyanato- (aka: 1,6- Hexamethylene diisocyanate) (CAS #822-06-0)

.

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne air facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Attachment XIII.
TSCA Section 8(d) Studies

Study on Behalf of Rohr, Inc.

Rohr, Inc. is notifying the Environmental Protection Agency of the completion and submittal of a study on Ethane, 1,1,2-trichloro- 1,2,2 trifluoro- (aka: Freon 113, Chlorinated fluorocarbon) (CAS #76-13-1).

Completion Date: June 29, 1992

Purpose: To assess, based on available empirical date, the potential risk of human health posed by airborne facility emissions of selected chemicals.

Type of data collected: Air emissions of the selected chemicals, modelling data on dispersion and availability for exposure, exposure assessment, and risk assessment.

Name of Submitting Official:

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Manufacturing Facility for Submittal:

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FINAL

ASSESSMENT OF RISKS FROM POTENTIAL EXPOSURE TO AIRBORNE FACILITY EMISSIONS UNDER CALIFORNIA AB 2588 FOR THE ROHR, INC. FACILITY RIVERSIDE, CALIFORNIA SCAQMD FACILITY ID #051398 VOLUME I

MAY, 1992

for

ROHR, INC.
8200 Arlington Avenue
Riverside, California
92503-1499

by

ENVIROLOGIC DATA, INC.
4820 McGrath Street, Suite 100
Ventura, California
93003

and

GROUNDWATER TECHNOLOGY, INC.
APPLIED AIR TECHNOLOGY DIVISION
20000/200 Mariner Avenue
Torrance, CA
90503-1670

FINAL

ASSESSMENT OF RISKS FROM POTENTIAL EXPOSURE TO AIRBORNE FACILITY EMISSIONS UNDER CALIFORNIA AB 2588 FOR THE ROHR, INC. FACILITY RIVERSIDE, CALIFORNIA SCAQMD FACILITY ID #051398 VOLUME I

MAY, 1992

Paul A. McCaw

Paul A. McCaw
Environmental Health Scientist
Risk Assessment Project Manager

David Vensel

David Vensel
Lead Air Quality Engineer
Air Dispersion Modeling
Project Manager

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EXECUTIVE SUMMARY

Rohr, Inc. (Rohr) is a manufacturer of military and commercial aircraft components. The facility is located at 8200 Arlington Avenue in Riverside in an area which is zoned for commercial, manufacturing, and residential use. Two small offsite facilities are located at 7145 Arlington Avenue (Arlington Facility), near the main plant and another in Moreno Valley (Edgemont Facility) at 22135 Alessandro Boulevard. Processes which emit compounds listed (regulated) under the *Air Toxics Hot Spots Information and Assessment Act of 1987* (AB 2588) include metal surface preparation, welding, large scale painting, adhesive bonding, composite bonding and lay-up, degreasing, solvent wipe down, natural gas combustion, perchloroethylene dry cleaning, and process water cooling.

Envirologic Data has been contracted by Rohr to conduct a human health risk assessment of facility emissions under AB 2588. Envirologic Data, a unit of Groundwater Technology, Inc. is a professional consulting firm specializing in human health and environmental risk assessment. Risk estimates are based on estimated ambient air concentrations at the point of exposure. The exposure point air concentrations of these chemicals were determined through air dispersion modeling conducted by Applied Air Technology, a unit of Groundwater Technology, based on the Air Toxics Inventory Report (ATIR). The ATIR was completed as a component of AB 2588.

The first component of the risk assessment process was the selection of indicator chemicals. The selection of indicator chemicals was conducted in accordance with South Coast AQMD guidelines in order to determine the chemicals which contribute the most to any facility-related health risk. Chemicals which were not quantitatively evaluated in this health risk assessment were found (via the selection process) to pose no significant acute or chronic, non-carcinogenic or carcinogenic health risks. Groundwater Technology used the ATIR and the air dispersion model ISCST (Industrial Source Complex Short Term) to predict annual average and maximum one hour concentrations of the chemicals. Emissions data from 1989 and meteorological data for the Riverside Airport from 1981 were used in the modeling.

Based on the presence of residential receptors, the types of compounds emitted from the facility, and other factors affecting potential exposures, the following exposure pathways were evaluated: (1) inhalation of chemicals, (2) incidental ingestion of soils, (3) dermal contact with soils, and (4) ingestion of homegrown crops.

Chronic and acute Hazard Indices (HIs) were calculated for the potential non-carcinogenic effects of facility emissions. Incremental cancer risk and excess population cancer burden resulting from emissions of potentially carcinogenic chemicals were also calculated. In order to provide information for various points of exposure in the vicinity of the facility, risks and HIs were calculated for the Maximally Exposed Individual (MEI) for residential and occupational receptors and selected sensitive receptor points within the zone of impact. The MEI is the receptor point at which the highest off-site chemical concentration occurs. This assessment was based on CAPCOA mandated assumptions including Lifetime Continuous Exposure (LCE). This means that it was assumed residents would be exposed to facility emissions at the same location, 24 hours per day, 365 days per year, for 70 years. For occupational individuals (those in the workplace) this exposure was adjusted for working hours as recommended by CAPCOA using an adjustment factor of 0.15.

It should be noted that the results of the risk assessment should be used with caution. As stated in the 1991 CAPCOA Risk Assessment Guidelines "... the risk levels generated in a risk assessment are useful as a yardstick to compare one source with another and prioritize concerns. Risk estimates generated by a risk assessment should not be construed as the expected rates of disease in the exposed population but are merely estimates of risk, based on current knowledge and a large number of assumptions. In addition, the estimates of risk generated by risk assessments frequently are with reference to a maximally exposed person".

RESULTS OF CAPCOA MANDATED EVALUATION

The results of the risk assessment using the CAPCOA mandated exposure assumptions are:

(1) The total LCE risk for potential residential exposure to facility emitted chemicals ranges from 0 to 1.5×10^{-5}. The total LCE risk for potential occupational exposure to facility emitted chemicals ranges from 0 to 2.9×10^{-6}. This occupational risk estimate is below the notification level of 1×10^{-5} as presented in the SCAQMD supplemental guidelines for preparing risk assessments to comply with AB2588.

(2) The total LCE chronic HI for potential residential exposure to chemicals at the MEI location by endpoint are:

Toxicological Endpoint	Residential - HI
Cardiovascular System	0.00
Central Nervous System	0.030
Immunological System	0.002
Kidneys	0.004
Gastro-intestinal System/Liver	0.03
Reproductive System	0.10
Respiratory System	1.1

All HIs are below the notification level (i.e., HI <0.5) as presented in the SCAQMD supplemental guidelines except for respiratory effects. Sodium hydroxide and isocyanates together contribute 86% to the total HI for respiratory effects.

(3) The total LCE chronic HI for potential occupational exposure to chemicals at the MEI location by endpoint are:

Toxicological Endpoint	Occupational - HI
Cardiovascular System	0.00
Central Nervous System	0.004
Immunological System	0.0002
Kidneys	0.0002
Gastro-intestinal System/Liver	0.006
Reproductive System	0.01
Respiratory System	0.1

All HIs are below the notification level as presented in the SCAQMD (<0.5) supplemental guidelines.

(4) The total acute HI associated with potential residential exposure to facility emitted chemicals at the MEI location is 0.2. The total acute HI associated with potential occupational exposure to facility emitted chemicals at the MEI location is 0.08.

The population cancer burden is an estimate of the potential number of cases of cancer which may occur in the exposed population. The population cancer burden was calculated by multiplying the risk estimate by the population of the zone of impact. Based upon the hypothetical LCE exposure scenario, the population cancer burden associated with facility emissions range from 0 to 0.04.

Based on the results of this risk assessment, Envirologic Data concludes that estimated cancer health risks associated with residential exposure to facility emissions are above the notification level of 1×10^{-5} as presented in the SCAQMD guidelines. Estimated cancer health risks for occupational receptors are below the notification level. In addition, with the exception of the total chronic HI for respiratory effects, all HIs are less than the notification level of 0.5 for a hazard index. It should be noted that for

respiratory effects, sodium hydroxide and isocyanates emissions result in approximately 90% of the total HI. Due to the many conservative assumptions incorporated into this assessment, the actual risks and hazard indices for all chemicals are probably lower than estimated.

RESULTS OF ALTERNATIVE EVALUATION/UNCERTAINTY ANALYSIS

An alternative evaluation was performed to provide an indication of the uncertainty associated with the CAPCOA mandated risk assessment as well as to provide more realistic estimates of carcinogenic and non-carcinogenic health risks. The alternative evaluation included the use of more realistic exposure parameter values. The values used were based on current United States Environmental Protection Agency risk assessment methodology as presented in the EPA Exposure Factors Handbook and the EPA Risk Assessment Guidance for Superfund (Part A: Human Health Evaluation Manual). Two alternative exposure scenarios were developed: the Reasonable Maximum Exposure (RME) and the Average Exposure. Additionally, the alternative evaluation does not include ethylene dichloride (EDC) emissions in the compilation of risk and HI values. This is due to the fact that the use of EDC at the facility was eliminated in July 1990, after the submittal of the ATIR.

Appendix A presents a complete discussion of and justification for the alternative exposure parameter values used in this analysis. All other assumptions such as emission rates, estimated ambient air concentrations, and toxicity criteria (Unit Risk Factors and Acceptable Exposure Levels) were the same as mandated by CAPCOA.

Risks and HIs are presented for the residential MEI only. The alternative evaluation is intended to provide a basis of comparison with the CAPCOA mandated risk assessment and may be valuable in the risk management process.

The results of the alternative evaluation or uncertainty analysis for residential exposure indicate:

(1) The total estimated RME cancer risk for potential carcinogens emitted from the facility (3.0×10^{-6}) is approximately 79% less than the risk estimate based on the CAPCOA mandated LCE.

(2) The total estimated Average Exposure cancer risk for potential carcinogens emitted from the facility (8.7×10^{-7}) is approximately 94% less than the risk estimate based on the CAPCOA mandated LCE.

(3) The total estimated RME HIs by endpoint are:

Toxicological Endpoint	RME - HI	Comparison to LCE HI
Cardiovascular System	0.00	= the LCE
Central Nervous System	0.020	24% < the LCE
Immunological System	No chemicals with immunological effects evaluated	
Kidneys	0.0015	62% < the LCE
Gastro-intestinal System/Liver	0.018	31% < the LCE
Reproductive System	0.075	24% < the LCE
Respiratory System	0.82	24% < the LCE

(4) The total estimated Average HIs by endpoint are:

Toxicological Endpoint	AVERAGE - HI	Comparison to LCE HI
Cardiovascular System	0.00	= the LCE
Central Nervous System	0.019	27% < the LCE
Immunological System	no chemicals with immunological effects evaluated	
Kidneys	0.00017	93% < the LCE
Gastro-intestinal System/Liver	0.018	27% < the LCE
Reproductive System	0.072	27% < the LCE
Respiratory System	0.78	27% < the LCE

Based on the SCAQMD *Supplemental Guidelines For Preparing Risk Assessments to Comply with the Air Toxics "Hot Spots" Information and Assessment Act [AB 2588]*, the RME and average cancer risk estimates at the residential MEI are less than the notification level of 1 in 100,000. In addition, with the exception of the total HI for respiratory effects, all HIs are less than the notification level of 0.5 for a Hazard Index. It should be noted that for respiratory effects, sodium hydroxide and isocyanates emissions result in approximately 90% of the total HI.

ASSESSMENT OF RISKS FROM POTENTIAL EXPOSURE TO AIRBORNE FACILITY EMISSIONS UNDER CALIFORNIA AB 2588 ROHR, INC. FACILITY RIVERSIDE, CALIFORNIA SCAQMD FACILITY ID # 051398

1.0 INTRODUCTION

Rohr, Inc. (Rohr) is a manufacturer of military and commercial aircraft components. The facility is located at 8200 Arlington Avenue in Riverside in an area with mixed zoning which includes commercial, manufacturing, and residential zones. Two small offsite facilities are located at 7145 Arlington Avenue (Arlington Facility), near the main plant and the other in Moreno Valley (Edgemont Facility) at 22135 Alessandro Boulevard. Processes which emit compounds listed (regulated) under AB 2588 include metal surface preparation, welding, large scale painting, adhesive bonding, composite bonding and lay-up, degreasing, solvent wipe down, natural gas combustion, perchloroethylene dry cleaning, and process-water cooling.

Envirologic Data has been contracted by Rohr to conduct a human health risk assessment of facility emissions. Envirologic Data (a unit of Groundwater Technology, Inc.) is a professional consulting firm specializing in human health and environmental risk assessment. Risk estimates are based on estimated ambient air concentrations at the point of exposure. The exposure point concentrations of these chemicals were determined through air dispersion modeling conducted by the Applied Air Technology Unit of Groundwater Technology, Inc. (Groundwater Technology) based on the Air Toxics Inventory Report (ATIR) compiled by Groundwater Technology. The ATIR was completed as a component of AB 2588 *Air Toxics "Hot Spots" Information and Assessment Act of 1987* (GTI, 1991).

1.1 BACKGROUND TO AB 2588

AB 2588 was enacted in response to public questions regarding the release of chemicals into the atmosphere. Information provided to the Air Quality Management Districts (AQMDs), Air Pollution Control Districts (APCDs) (districts), and the California Air Resources Board (CARB) by the facilities are utilized to assess chemical emissions. The initial component of AB 2588 requires that the sources of air emissions perform an Emissions Inventory Plan (EIP) detailing how facility emissions will be quantified. The second task of AB 2588 is to implement the emissions inventory plan and submit an Emissions Inventory Report (ATIR) for review by the district. One goal of this legislation is to determine the nature and quantity of chemical emissions from specific sources that may adversely affect public health. This is done through the completion of a health risk assessment. At the discretion of the ARB and the districts, a facility must be ranked for the purposes of the health risk assessment. This risk assessment was completed in order to assess potential health risks associated with facility emissions as defined in the ATIR.

Risk assessment methodologies may be applied to evaluate the potential human health effects associated with exposure to industrial air emissions. To date, the EPA has yet to promulgate any definitive air emissions risk assessment protocol. California, however, addressed potential health effects due to chemical emissions in the State Legislature's Tanner Bill (1983). Under this statute, the CARB is required to submit candidate air contaminants to the Department of Health Services (DHS) for the purpose of evaluating potential human health effects. Following a review by both the CARB and an independent scientific review panel, a public hearing is held to consider adding a particular substance to the list of regulated air contaminants. If the substance is considered a significant threat to human health, appropriate control measures may be developed and implemented.

Technical guidelines for California were developed in 1987 with the California Air Pollution Control Officers Association (CAPCOA) "Air Toxics Assessment Manual". Additional guidelines were developed specifically for use in AB 2588 and is titled CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines (CAPCOA,

1991). These documents provide guidelines for conducting quantitative public health impacts for airborne chemical emissions. Both of these documents were consulted in completing the AB 2588 risk assessment for this facility.

1.2 REPORT OVERVIEW

The purpose of this report is to assess, based on the available empirical data, the potential risk to human health posed by airborne facility emissions. This will be performed by first identifying and evaluating indicator chemicals released from the facility. Envirologic Data will evaluate the possible carcinogenic effects and potential chronic and acute non-carcinogenic health effects associated with exposure to facility emitted chemicals. The toxicological assessment and presentation of the Unit Risk Factors (URFs) and chronic and acute Allowable Exposure Limits (AELs) for indicator chemicals is presented in Section 2.0, *Toxicological Profiles*. Evaluation of potential receptor populations and exposure scenarios is presented in Section 3.0, *Exposure Assessment*. Summaries of the air dispersion modeling results are also presented in Section 3.0. The quantitative results of the risk assessment are presented in the form of upper-bound incremental risks, excess population cancer burden, and acute and chronic Hazard Indices (HI) in the *Risk Characterization* (Section 4.0). Section 5.0, *Conclusions*, summarizes the results of this risk assessment.

1.3 INTRODUCTION TO RISK ASSESSMENT

Overview

The principle of risk assessment can be described in a single equation:

$$\textit{Hazard x Exposure} = \textit{Risk}$$

Hazard is a measure of the toxicity of a chemical and exposure is a measure of the dose being received by a designated receptor. The resulting risk represents the probability that an adverse effect will occur. The steps of formal risk assessment outlined in the following section presents a methodology reflecting this basic equation that can be applied in a variety of situations. Risk assessment is defined by the National Academy

of Sciences (NAS) as the characterization of the probability of potential adverse health effects from human exposures to environmental hazards (NRC, 1983).

A number of current risk estimation procedures fail to adequately evaluate the information used to quantify the hazard and exposure. It is imperative that risk assessments evaluate the wide array of assumptions incorporated in the toxicity evaluation and the exposure estimation; not only with regard to their validity but also with their applicability to the case being studied.

Many assessments rely solely on what are referred to as conservative toxicity and exposure estimates. If the error in the accuracy of those estimates is large, then the products of those errors can lead to excessive inaccuracy in the final estimation of risk. The risk assessment must have the goal of being protective of the public health and accurate yet not excessively conservative as to render it useless to the regulator. As per NAS recommendations, Envirologic Data risk assessments are executed in the following sequential steps:

* *Hazard Identification*
* *Dose-Response Assessment*
* *Exposure Assessment*
* *Risk Characterization* (NRC, 1983; EPA, 1986)

Hazard Identification is a qualitative assessment, reviewing any relevant biological and chemical data to determine whether exposure to an agent will adversely affect human health (*i.e.*, cancer, birth defects, *etc.*) (NRC, 1983; EPA, 1986). The available information is melded into what the EPA refers to as a "weight-of-evidence" determination. The EPA in it's 1980 Cancer Guidelines (CFR, 33,992; 1986) summarize their approach to applying of the weight of evidence test:

> "The overall scheme for categorization of the weight of evidence of carcinogenicity of a chemical for humans uses a three step process, (1) The weight of evidence in humans studies or animal studies is summarized; (2) these lines of information are combined to yield a tentative assignment to a category; and (3) all relevant supportive information is evaluated. Relevant factors to be included along with the tumor information from

> human and animal studies include structure-activity relationships; short-term test findings; results of appropriate physiological, biochemical and toxicological observations; and comparative metabolism and pharmacokinetic studies. The nature of these findings may cause one to adjust the overall categorization of the weight of evidence."

The hazard identification attempts to establish the potential for a particular chemical to evoke an adverse health effect and evaluates both carcinogenic and non-carcinogenic endpoints. Epidemiologic studies are the most desirable sources of data. They can be used to identify prominent adverse human health effects by eliminating the need for "animal to human" extrapolation. Difficulties with epidemiologic studies, however, stem from the inability to accurately establish past exposure levels and identifying a proper control group. Furthermore, measured levels are usually derived from occupational settings. Often, the occupational setting involves exposure to high concentrations of chemicals. Whereas the exposures in the general population are likely to involve low doses.

If appropriate epidemiologic studies are unavailable, animal studies are reviewed to predict the potential for adverse human health effects. In this circumstance, the design of the animal study must be considered. For example, lab animal studies involve exposures to extremely high dose to ensure a measurable response. The concern, however, is that such high doses induce multiple effects and compromise the animal's ability to respond. If normal defense mechanisms are saturated at high exposure levels, then the ability of the animals to respond to the chemical insult is also compromised. The utility of extrapolating to much lower levels (more likely encountered by humans), where defense mechanisms are intact, is therefore reduced. The hazard identification must evaluate the animal data to assist in understanding the potential for human health effects.

A *Dose-Response Assessment* is the process of characterizing the quantitative relationship between the dose of an agent and the incidence of adverse health effects in an exposed receptor population (NRC, 1983). The end result of the dose-response assessment is a probability estimate of the incidence of the adverse effect as a function of human exposure to the chemical. Two endpoints are evaluated separately: non-carcinogenic and carcinogenic effects.

Exposures of humans to non-carcinogenic chemicals are modeled by an allowable daily exposure level, termed the Reference Dose (RfD). The RfD represents the maximum daily dose of a chemical to which a human may be exposed and not be adversely affected. In most cases, the RfD is based on non-toxic exposure levels in animals extrapolated to humans using safety factors. This method assumes that these exposures have a threshold, *i.e.*, there is some exposure level below (threshold) which an adverse effect will not occur in the exposed individual.

Human exposures to carcinogenic chemicals are derived mathematically. They are based either on animal, or when available, epidemiologic studies. Many of these models, such as the linear non-threshold model predict a non-threshold and linear dose-response curve which bisects the origin (*i.e.*, a theoretical risk exists at all exposure levels, however minute). As recommended by the EPA *Guidelines for Carcinogen Risk Assessment* (EPA, 1986) and the National Research Council (NRC, 1983), the dose-response assessment should describe and justify the methods of extrapolation used to predict incidence and should also provide a description of the uncertainty inherent in these methods.

The *Exposure Assessment* is the process of measuring or estimating exposures to an agent in the environment. The exposure assessment describes the magnitude, duration, timing, and route of exposure; the size and nature of the populations exposed; and the uncertainties in all estimates. The goal of the exposure assessment is to accurately estimate both the dose to which the receptor is being exposed (administered dose) and the dose of the chemical reaching the target tissue in the receptor (target dose). Human exposures are reported as a Average Daily Dose (ADD) for non-carcinogens and Lifetime Average Daily Dose (LADD) for carcinogens.

Risk Characterization entails the act of quantitatively estimating risk (EPA, 1986). The risk characterization is performed by combining the quantitative exposure and dose-response assessments, including the uncertainties identified in the preceding steps. Presentations of assumptions and associated uncertainties permit the risk manager to make a more informed decision. In risk assessments on human exposures, the *de minimis* (insignificant) risk levels of 1 in 10,000 to 1 in 1,000,000 (1×10^{-4} to 10^{-6}) are frequently used as benchmarks for an acceptable risk level.

Risk assessment calculations can be evaluated in a number of ways. First, a risk estimated from a given activity and exposure can be compared to a *de minimis* risk level. Second, beginning with an acceptable *de minimis* risk level, (*e.g.*, 1 in 100,000), the exposure associated with that risk, and the concentration of chemical which would need to be present to result in that exposure, can be calculated. Finally, some parameters of the exposure assessment can be estimated if an acceptable risk and chemical contaminant concentration are known. For example, the concentration of a chemical which would be allowed to exist in an environmental matrix (*e.g.* air) and not exceed a given risk level in the exposed population can be estimated. In all three examples of risk assessment calculations, the uncertainties and assumptions associated with the assessment need to be presented to provide an understanding of its limitations and conservatism.

1.4 TYPES OF RISK ASSESSMENT

Formal human and environmental health risk assessments are used by regulators, public officials, industry representatives, and the public to make risk management decisions. Risk assessment provides necessary information to the risk manager to consider in conjunction with the economic and political issues associated with a given site. Risk assessment collects and interprets the applicable information on toxicity and exposure. Together with the limitations and assumptions, the risk assessment conclusions can be used in environmental decision-making which is "preventive," "comparative", and "predictive."

The use of risk assessment in decision-making is "preventive" in minimizing or eliminating exposures to toxic agents. Risk assessment is used to identify which pathways might present unacceptable risks to a given exposure scenario. The abatement of these activities, whether voluntary or involuntary, is meant to reduce the exposure and therefore "prevent" the onset of potentially adverse health effects.

Risk assessments can be used for "comparative" purposes. The risk from one activity can be compared to other activities. The analysis can determine which activity poses the least or greatest risk to the exposed population. Risk assessments used for comparative purposes are essential for adequate risk management decisions such as prioritizing

remedial efforts on hazardous waste sites. The use of comparative risk assessments can be the basis for an environmental remediation program (agency or industry-driven) which is a "risk-reduction" program.

"Predictive" risk assessments can evaluate whether current site conditions will cause adverse health effects in exposed populations in the future. "Predictive" risk assessments are heavily dependent upon models to estimate future exposures and potential health effects. Often, these models incorporate parameters which may change with time at an unknown rate. Although an exposure may be decreasing over time, with a subsequent decrease in risk, the magnitude of the reduction may not be possible to quantify. This inability to estimate decreasing exposure over time increases the conservatism and uncertainty in any final risk estimate.

Risk assessments conducted by regulatory agencies typically incorporate a number of conservative assumptions. These include constant exposures to chemicals over time or assume a non-threshold dose-response carcinogenic mechanism. The first results in an over-estimation of the lifetime exposure and lifetime risk, while the second presumes that there is a risk, however minute to any level of a harmful substance. Federal regulatory health agencies such as the EPA and the Food and Drug Administration (FDA) are in the process of further elucidating uncertainty in their predictive power via incorporation of environmental fate data into exposure scenarios, *i.e.*, chemical half-life data; the time required for the concentration of the chemical to decrease by one-half. As risk assessments incorporate this type of data into the process, their "predictive" power will have less uncertainty.

1.5 REFERENCES

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2.0 HAZARD IDENTIFICATION/DOSE-RESPONSE ASSESSMENT

Hazard Identification is a qualitative assessment that contains a review of the relevant biological and chemical information to determine whether or not exposure to an agent may pose a hazard or increase the incidence of a health condition or effect (*e.g.*, cancer, birth defects, etc.) (NRC, 1983; EPA, 1986). Human health effects studies are preferred over animal studies because of inter-species variation in dose-response relationships. However, when adequate human data does not exist, animal studies are relied upon to gain an understanding of the potential for human health effects.

Dose-Response Assessment is the process of characterizing the quantitative relationship between the dose of a chemical or agent and the incidence of adverse health effects in exposed populations (NRC, 1983). The end result of the dose-response assessment is a probability estimate of the incidence of the adverse effect as a function of human exposure to the chemical.

2.1 DOSE-RESPONSE VALUES USED FOR AB 2588 ANALYSIS

Dose-response values used in an AB 2588 analysis include unit risk factors (URFs) and allowable exposure levels (AELs). The DHS has compiled the URFs and AELs which should be used in all risk assessments for the Air Toxics "Hot Spots" Act (CAPCOA, 1991). The URF, expressed as $(\mu g/m^3)^{-1}$, is the dose-response value used to estimate excess cancer risk for a substance through the inhalation pathway. The unit risk factor (URF) is defined as the theoretical statistical upper bound probability of a person contracting cancer as a result of continual exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70 year lifetime. To calculate carcinogenic risk through non-inhalation pathways, a cancer slope factor must be calculated from the URF. This is done by converting the units to $(mg/kg\text{-}day)^{-1}$ by assuming a 20 m^3/day inhalation rate and a 70 kilogram body weight.

For non-cancer health effects due to inhalation exposure, an AEL is used. The AEL is an estimate of the allowable concentration of a chemical in air (i.e. $\mu g/m^3$) to which a human population (including sensitive sub-populations) may be exposed without

experiencing adverse health effects over a lifetime. The assumption is made that the effects of each substance are additive for a given organ system. Acceptable exposure levels for chronic and acute exposure are provided by the CAPCOA (1991). To calculate non-carcinogenic risk through non-inhalation pathways, a reference dose must be calculated from the AEL. This is done by converting the units to (mg/kg-day) by assuming a 20 m^3/day inhalation rate and a 70 kilogram body weight.

2.2 SELECTION OF INDICATOR CHEMICALS

When a number of chemicals are emitted from a facility, a subset of "indicator" chemicals can be selected for further consideration (EPA, 1989). The goal of the selection process is to identify the chemicals which are most likely to contribute significantly to potential carcinogenic and non-carcinogenic risks (EPA, 1989). In this way, the risk assessment is focused on the "most significant" chemicals (EPA, 1989). This section presents the selection of indicator chemicals for the Rohr Riverside Facility.

2.2.1 *Screening Process*

The purpose of the selection process is to determine which chemicals pose the most significant health risk, and therefore, require quantification in the risk assessment. The selection process for AB 2588 listed carcinogens and non-carcinogens is essentially the same. For selection purposes, all DHS-listed carcinogens were evaluated in a single group from which indicator chemicals were identified. Non-carcinogens were also evaluated as a separate group.

The screening process was used in accordance with South Coast AQMD guidelines (SCAQMD, 1991). The selection process for carcinogens involves the calculation of a maximum individual cancer risk (MICR) for each carcinogenic chemical emitted. It should be noted that an MICR is not an estimate of risk but rather a value used strictly for the purpose of selecting chemicals which may possibly contribute a significant risk. The equation for calculation of the MICR is presented below.

$$MICR = ER \times (X/Q) \times URF$$

In this equation, "ER" (designated as "Q" in the SCAQMD guidance) is the emission rate for the compound in pounds per day. "URF" is the unit risk factor for the compound and "X/Q" is the dispersion factor. The dispersion factor is based on a distance of 150 to 200 meters to the receptor and a stack height of 25 to 50 feet (SCAQMD, 1991).

Carcinogenic chemicals with MICRs greater or equal to 1×10^{-8} were retained for further evaluation (Chun, 1992).

For non-carcinogens, the first step in the selection process is the calculation of the maximum exposure level (MEL) for each non-carcinogenic chemical emitted. The equation for this calculation is presented below:

$$MEL = ER \times (X/Q)$$

The second step for non-carcinogenic compounds is the calculation of a hazard index as shown in the equation below.

$$HI = \frac{MEL}{AEL}$$

Non-carcinogens with HIs greater or equal to 0.001 were retained for further evaluation (Chun, 1992).

The following tables present the screening process for all chemicals emitted from the facility. Chromium(VI) is not included in these tables. Although the emissions inventory report for the year 1989 revealed substantial emissions of chromium(VI), it has since been discovered that not only were these emissions overestimated, but chromium(VI) has since been eliminated from all processes. Emissions of chromium(VI) were grossly overestimated due to computational errors and the incorrect application of an emission

factor for all the chromate containing tanks. In addition, Rohr has eliminated the use of chromate solutions in the metal treating process line. As agreed in correspondence between Groundwater Technology and the staff of the SCAQMD, chromium(VI) will not be evaluated in this assessment and is not included in the screening process. Appendix B contains the permit application which verifies the chromium(VI) reduction. In July of 1990 the use of ethylene dichloride (EDC) was eliminated due to the substitution of other chemical for EDC by the manufacturer of the primary material containing EDC; adhesive bond primer. Primer spray application represents 90-95 percent of the ethylene dichloride emissions. This substitution, however, occurred after the submittal of the ATIR and therefore will not be reflected in the risk assessment. Appendix B contains a letter from the adhesive bond primer manufacturer describing this substitution. The alternative evaluation presented in Appendix A, however, will not include ethylene dichloride.

TABLES 2-1, 2-2 and 2-3 present the screening process for potential carcinogens, chronic non-carcinogens, and acute non-carcinogens, respectively. TABLE 2-4 is a compilation of all chemicals retained for further evaluation in the risk assessment. Chemicals deleted through this selection process include:

- carcinogens - lead;
- chronic non-carcinogens - cadmium, lead, gasoline vapors, nickel, propylene oxide, copper, zinc, and ethylene oxide; and
- acute non-carcinogens - none.

TABLE 2-1

SCREENING OF CHEMICALS EMITTED FROM THE ROHR RIVERSIDE FACILITY - POTENTIAL CARCINOGENS

Carcinogenic Chemicals	ER (lbs/day)	Unit Risk $(\mu g/m^3)^{-1}$	X/Q	MICR	Retain?
Acrylonitrile	0.0060	0.00029	1.045	1.8E-6	Yes
1,3 Butadiene	0.0010	0.00028	1.045	3.0E-7	Yes
Benzene	0.12	0.000029	1.045	3.7E-6	Yes
Carbon Tetrachloride	0.11	0.000042	1.045	4.8E-6	Yes
1,4-Dioxane	0.33	0.0000077	1.045	2.6E-6	Yes
Ethylene Dichloride	3.21	0.000022	1.045	7.4E-5	Yes
Ethylene Oxide	0.02	0.000088	1.045	1.7E-6	Yes
Cadmium	0.00021	0.0042	1.045	9.0E-7	Yes
Lead	0.00030	0.000008	1.045	2.5E-9	No
Formaldehyde	0.28	0.000013	1.045	3.9E-6	Yes
Gasoline Vapors	1.75	0.00000085	1.045	1.6E-06	Yes
Isocyanates	1.31	0.00001	1.045	1.4E-5	Yes
Methylene Chloride	37.13	0.000001	1.045	3.9E-5	Yes
Nickel	0.0011	0.00024	1.045	2.8E-7	Yes
Propylene Oxide	0.0027	0.0000037	1.045	1.1E-8	Yes
Perchloroethylene	4.45	0.00000058	1.045	2.7E-6	Yes
			TOTAL	1.5E-4	

ER = Emission Rate
MICR = Maximum Individual Cancer Risk

TABLE 2-2

SCREENING OF CHEMICALS EMITTED FROM THE ROHR RIVERSIDE FACILITY - NON-CARCINOGENS (CHRONIC)

Non-Carcinogenic Chemicals (Chronic)	ER (lbs/day)	AEL Inhalation	X/Q	MEL	Hazard Index	Retain?
Benzene	0.12	71	1.045	0.13	0.0018	Yes
Carbon Tetrachloride	0.11	2.4	1.045	0.114	0.0475	Yes
Ethylene Dichloride	3.21	95	1.045	3.35	0.0353	Yes
Cadmium	0.00021	3.5	1.045	0.00022	0.000061	Yes*
Lead	0.00030	1.5	1.045	0.00032	0.00021	No
Formaldehyde	0.28	3.6	1.045	0.297	0.0824	Yes
Gasoline Vapors	1.8	2100	1.045	1.83	0.000872	No
Isocyanates	1.3	0.095	1.045	1.37	14.4	Yes
Methylene Chloride	37	3000	1.045	38.8	0.0129	Yes
Nickel	0.0011	2.4	1.045	0.00117	0.000489	No
Propylene Oxide	0.0027	700	1.045	0.00286	0.00000409	No
Perchloroethylene	4.5	35	1.045	4.65	0.133	Yes
Copper	0.0016	35	1.045	0.00169	0.0000483	No
Chlorofluorocarbons	65	700	1.045	67.9	0.0970	Yes
Zinc	0.00014	35	1.045	0.000143	0.00000409	No
Phenol	0.29	45	1.045	0.306	0.00681	Yes
Manganese	0.0012	1	1.045	0.00123	0.00123	Yes
Methanol	0.88	620	1.045	0.915	0.00148	Yes
Chlorine	0.30	7.1	1.045	0.32	0.045	No
Hydrogen Fluoride	0.109	5.9	1.045	0.114	0.019	Yes
Glycol Ether	22	10	1.045	22.6	2.26	Yes
Sodium Hydroxide	5.3	4.8	1.045	5.57	1.16	Yes
Toluene	24	2000	1.045	25	0.0125	Yes
Xylenes	24	300	1.045	25.2	0.0838	Yes
Methyl Chloroform (1,1,1-TCA)	320	320	1.045	332	1.04	Yes
Ethylene Oxide	0.019	600	1.045	0.0195	0.0000324	No
				TOTAL	19.39	

ER = Emission Rate; AEL = Acceptable Exposure Level; MEL = Maximum Exposure Level
* = Although cadmium is below the level for retainment, it is evaluated for multipathway noncarcinogenic exposure and was therefore kept for all routes of exposure.

TABLE 2-3

SCREENING OF CHEMICALS EMITTED FROM THE ROHR RIVERSIDE FACILITY - NON-CARCINOGENS (ACUTE)

One-Hour Non-Carcinogenic Chemicals (Acute)	ER (lbs/day)	AEL Inhalation ($\mu g/m^3$)	X/Q	MEL	Hazard Index	Retain?
Carbon Tetrachloride	0.11	190	7.101	0.77	0.0041	Yes
Lead	0.00030	1.5	7.101	0.00214	0.00142	Yes
Chlorine	0.3	23	7.101	2.15	0.093	Yes
Formaldehyde	0.28	370	7.101	2.02	0.0055	Yes
Methylene Chloride	37	3500	7.101	264	0.075	Yes
Perchloroethylene	4.5	6800	7.101	31.6	0.0047	Yes
Hydrogen Fluoride	0.109	580	7.101	0.77	0.0013	Yes
				TOTAL	0.191	

ER = Emission Rate
AEL = Acceptable Exposure Level
MEL = Maximum Exposure Level

TABLE 2-4

CHEMICALS RETAINED FOR AIR DISPERSION MODELING

Potentially Carcinogenic Chemicals	Non-Carcinogenic (Chronic)	Non-Carcinogenic (Acute)
Acrylonitrile	Benzene	Carbon Tetrachloride
1,3 Butadiene	Carbon Tetrachloride	Chlorine
Benzene	Formaldehyde	Formaldehyde
Carbon Tetrachloride	Isocyanates	Methylene Chloride
1,4-Dioxane	Methylene Chloride	Perchloroethylene
Perchloroethylene	Perchloroethylene	Hydrogen Fluoride
Ethylene Oxide	Chlorofluorocarbons	Lead
Cadmium	Phenol	
Formaldehyde	Manganese	
Gasoline Vapors	Methanol	
Isocyanates	Chlorine	
Methylene Chloride	Hydrogen Fluoride	
Nickel	Glycol ether	
Propylene Oxide	Sodium Hydroxide	
Ethylene Dichloride	Toluene	
	Xylenes	
	Ethylene Dichloride	
	Methyl Chloroform (1,1,1-TCA)	

2.3 PRESENTATION OF DOSE-RESPONSE VALUES FOR INDICATOR CHEMICALS

This section contains the dose-response values for each chemical as specified for use in the CAPCOA risk assessment guidelines (CAPCOA, 1991). TABLE 2-5 presents the URFs for the carcinogens emitted from the facility. TABLE 2-6 presents the chronic and acute AELs and the health effects associated with the non-carcinogenic chemicals emitted from the facility. TABLE 2-7 presents the reference doses and cancer slopes factors for multipathway chemicals.

TABLE 2-5

UNIT RISK FACTORS FOR AB 2588 LISTED CARCINOGENS EMITTED FROM ROHR RIVERSIDE FACILITY

Chemical Name	Unit Risk Factor
Acrylonitrile	2.9×10^{-4}
1,3-Butadiene	2.8×10^{-4}
Benzene	2.9×10^{-5}
Carbon Tetrachloride	4.2×10^{-5}
1,4-Dioxane	7.7×10^{-6}
Ethylene Dichloride	2.2×10^{-5}
Ethylene Oxide	8.8×10^{-5}
Cadmium	4.2×10^{-3}
Formaldehyde	1.3×10^{-5}
Gasoline Vapors	8.5×10^{-7}
Isocyanates	1.0×10^{-5}
Methylene Chloride	1.0×10^{-6}
Nickel	2.4×10^{-4}
Propylene Oxide	3.7×10^{-6}
Perchloroethylene	5.8×10^{-7}

TABLE 2-6
CHRONIC AND ACUTE ACCEPTABLE EXPOSURE LIMITS AND POTENTIAL HEALTH EFFECTS FOR AB 2588 LISTED NON-CARCINOGENS EMITTED FROM ROHR RIVERSIDE FACILITY

Chemical Name	Allowable Exposure Level (chronic)	Allowable Exposure Level (acute)	Chronic Non-cancer Target Organ or System
Benzene	71	NA	CNS
Carbon Tetrachloride	2.4	190	GI & Liver
Formaldehyde	3.6	370	Respiratory
Ethylene Dichloride	95	NA	Immun System, Kidney, GI & Liver
Isocyanates	0.095	NA	Respiratory
Methylene Chloride	3000	3500	CNS, GI & Liver
Perchloroethylene	35	6800	Not listed
Chlorine	7.1	23	Respiratory
Hydrogen Fluoride	5.9	580	Respiratory
Chlorofluorocarbons	700	NA	CNS
Glycol Ether	10	NA	Reproductive, Respiratory
Sodium Hydroxide	4.8	NA	Respiratory
Phenol	45	NA	Respiratory
Lead	NA	1.5	NA
Toluene	2000	NA	Developmental Toxicant
Manganese	1	NA	CNS, Respiratory
Xylenes	300	NA	Respiratory
Methyl Chloroform (1,1,1-TCA)	320	NA	CNS, GI & Liver
Methanol	620	NA	CNS

NA = Not Applicable; GI = Gastrointestinal Tract; CNS = Central Nervous System;
[1] = health effects assumed to be respiratory irritation for all acute effects.

TABLE 2-7
DOSE-RESPONSE VALUES ASSOCIATED WITH AB 2588 LISTED MULTIPATHWAY CHEMICALS EMITTED FROM ROHR RIVERSIDE FACILITY

Chemical Name	Oral Reference Dose (mg/kg-day)	Oral Cancer Potency Slope $(mg/kg\text{-}day)^{-1}$
Cadmium	1.0×10^{-3}	NA

NA = Not Applicable

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3.0 EXPOSURE ASSESSMENT

The *Exposure Assessment* is the process of measuring or estimating exposures to a chemical or agent in the environment. The exposure assessment describes the magnitude, duration, timing, and route of exposure, as well as the nature of the exposed populations and the uncertainties inherent in these estimates. The goal of the *Exposure Assessment* is to accurately estimate both the dose to which the receptor is being exposed (administered dose) and the dose of the chemical reaching the target tissue in the receptor (target dose). However, for this assessment, conservative, non-site specific exposure assumptions were used as mandated by CAPCOA (1991).

Estimating human exposures to chemicals through the inhalation pathway involves a simple calculation using the dose-response value for the chemical (a unit risk factor or a allowable exposure level) and the Ambient Air Concentration (AAC). The AAC is the 1-hour maximum or annual average chemical concentration in air and is predicted through the use of air dispersion modeling. For calculation of cancer risk or chronic non-carcinogenic risk, the annual average concentration is used in conjunction with the unit risk factor (URF) or chronic allowable exposure level (AEL), respectively. For calculation of acute non-carcinogenic risk, the 1-hour maximum air concentration is used with the acute AEL.

Estimation of exposure through non-inhalation pathways (multipathway) involves a more complicated process. For estimating non-inhalation carcinogenic risk, a lifetime average daily dose (LADD) must be calculated. The LADD is an estimate of the daily dose, averaged over a lifetime, received by the receptor. To calculate the LADD, a variety of exposure parameters are used in conjunction with the annual average AAC. The cancer slope factor (see Section 2.0) is then multiplied by the LADD to yield the cancer risk. For estimating non-inhalation non-carcinogenic risk, an average daily dose (ADD) is calculated by a variety of exposure parameters including the annual average AAC. The ADD is divided by the reference dose (see Section 2.0) to calculate the non-carcinogenic risk.

3.1 BACKGROUND TO EXPOSURE ASSESSMENT

The exposure scenarios presented in this report consist of (1) a description of the scenario evaluated, (2) a discussion of the methods used to calculate exposure, (3) a characterization of the potential receptor populations, (4) a description of the potential exposure pathways, (5) descriptions of the exposure pathways evaluated and parameters used, and (6) a flow chart which describes each exposure pathway. The flow chart outlines the steps in the exposure beginning with the emission of chemical from the facility and ending with the hazard index or risk. Calculations for the exposure scenarios are presented in Appendix C. In each of the calculations, the equations and parameter values used to quantify exposure are presented. The following sections of the exposure assessment (1) summarize the facility emissions and predicted exposure point chemical concentrations, (2) describe the potentially-exposed populations, and (3) present the exposure pathway and LCE scenario evaluated in this assessment. The LCE is a hypothetical scenario that assumes that an individual is located at the point of maximum impact 24 hours per day, 365 days per year for 70 years.

3.2 QUANTIFICATION OF FACILITY EMISSIONS

3.2.1 *Introduction*

As a result of AB 2588 Emission Inventory Reporting, the South Coast Air Quality Management District (SCAQMD) required the Rohr facility (as a high priority facility) to complete a health risk assessment. The facility manufactures military and commercial aircraft components. Emissions are related to a variety of general operations and sources. These include (1) spray booths, (2) fugitive solvent emissions, (3) natural gas combustion, (4) process dip tanks, (5) dry cleaning, (6) cooling towers, (7) laboratories, and (8) welding. The AB 2588 Air Toxics Inventory Report (ATIR) identified 155 emitting devices, and 33 separate chemicals emitted from the facility. Of these chemicals, 27 were chosen through the selection process (see Section 2.0) to be quantified in this evaluation.

3.2.2 *Air Dispersion Modeling Procedure*

One of the steps in performing a health risk assessment is to determine the ambient concentration of chemicals at specified locations adjacent to the facility. This can be accomplished through the use of computerized dispersion modeling. Air dispersion modeling has been developed throughout the past two decades through the refinement and application of basic dispersion algorithms to gaseous and particulate emissions through the sigma x, y, and z planes. Most of the air dispersion models in use today are Gaussian dispersion models, relying upon Gaussian-based dispersion algorithms. The models have been developed in conjunction with the US EPA, and extensive field validation studies have been conducted. Gaussian models are generally considered to be the state-of-the art technique for estimating the atmospheric dispersion of nonreactive emittents.

The ISCST model prepared by Bowman Environmental Engineering of Dallas, Texas, Version dated 90346, revision 6.96 was used to individually estimate the ambient concentrations of each chemical included in the health risk assessment following the screening. The emission points for each chemical were modeled as one source group. Area sources such as wipe down areas or composite bonding application areas inside buildings were modeled as being directly exhausted through roof vents at low exit velocity (0.1 m/s). Receptor points were located on the facility boundary, and at intervals of 50, 100 and 250 meters respectively to capture the point of maximum impact and maximally exposed individual. Additionally sensitive receptors such as schools, day care centers, and hospitals within approximately three kilometers of the facility were included (see Section 3.3.1.3.).

District required emissions tables, including the "Source and Stack Parameters", the "Process, Device, and Emission Detail", and the "Facility Emissions Summary Form" are located in Appendix F. The table of "Source and Stack Parameters" shows the emission point ID number, the device ID number, and the ID number designation in the model. For ease of identification point sources used stack ID numbers as the model ID (five digit number beginning with 9), and fugitive emission points including those modeled as low velocity release from building vents were

identified by the a five digit number which includes the fugitive emission point ID number preceded by a 7. The table of "Process, Device, and Emission Detail" includes the emission point ID number, emission point name, maximum hourly emission and annual average emission for each chemical emitted from the source. The "Facility Emissions Summary Form" is a list of the chemicals emitted form the facility, its CAS number, and the emission rate of each chemical (as reported in the ATIR and as used in the risk assessment).

ISCST Model Input Parameters

Model switches chosen for the ISCST runs for compounds with chronic hazard index or carcinogenic health risk were as follows:

ISW(1) = 1
ISW(2) = 1
ISW(3) = 1
ISW(4) = 0
ISW(5) = 0
ISW(6) = 1
ISW(7) = 0
ISW(8) = 0
ISW(9) = 0
ISW(10) = 0
ISW(11) = 0
ISW(12) = 0
ISW(13) = 0
ISW(14) = 0
ISW(15) = 1
ISW(16) = 0
ISW(17) = 1
ISW(18) = 1
ISW(19) = 1
ISW(20) = 3
ISW(21) = 1
ISW(22) = 1
ISW(23) = 0
ISW(24) = 1

ISW(25) = 2
ISW(26) = 1
ISW(27) = 2
ISW(28) = 2
ISW(29) = 2
ISW(30) = 2
ISW(31) = 0

Number of discrete receptor points = 594, or 676, or 752
Number of source groups = 1

Grid Spacing:

50 meter receptor grid spacing from the property line to 200 meters from the property line

100 meter receptor spacing from 300 meters from the property line to 500 meters from the property line

250 meter receptor spacing from 750 meters from the property line to 1 kilometer from the property line

Model switches chosen for the ISCST runs for compounds with acute hazard index were as follows:

ISW(1) = 1
ISW(2) = 1
ISW(3) = 1
ISW(4) = 0
ISW(5) = 0
ISW(6) = 1
ISW(7) = 1
ISW(8) = 0
ISW(9) = 0
ISW(10) = 0
ISW(11) = 0
ISW(12) = 0

ISW(13) = 0
ISW(14) = 0
ISW(15) = 1
ISW(16) = 0
ISW(17) = 1
ISW(18) = 1
ISW(19) = 1
ISW(20) = 3
ISW(21) = 1
ISW(22) = 1
ISW(23) = 0
ISW(24) = 1
ISW(25) = 2
ISW(26) = 1
ISW(27) = 2
ISW(28) = 2
ISW(29) = 2
ISW(30) = 2
ISW(31) = 0

3.2.3 *Receptor Points*

Air dispersion modeling was performed for the selected indicator chemicals using 1981 meteorological data from the Riverside Airport. The results indicated the hourly maximum and annual average concentration of each air toxic at discrete receptor locations around the facility. The hourly maximum concentrations were used to calculate acute HIs for non-carcinogenic health effects. The annual average concentration was used to calculate both chronic HIs and incremental cancer risks where appropriate.

A residential and occupational maximally exposed individual (MEI) for the site was determined from the modeling output. The MEI is the point of maximum impact where there is a receptor. The residential MEI for this site is located at UTM coordinates (457,300; 3,755,780). This point is located on the southern property line of the facility next to a residential area near Cypress Avenue. The occupational MEI is located at UTM coordinates (457,260; 3,756,170). This point is located to the north of Arlington Avenue and to the west of Paradise Day School. TABLE 3-1 presents the concentration

of each chemical at these points. Risks and hazard indices calculated at these points are presented in the Risk Characterization (Section 4).

3.2.4 *Graphical Output*

Graphical output for air dispersion modeling in the form of isopleth maps are presented in Appendix D for all indicator chemicals.

TABLE 3-1

MODELED AIR CONCENTRATIONS OF CHEMICALS AT MEI ($\mu g/m^3$)

Chemical Name	RESIDENTIAL MEI		OCCUPATIONAL MEI	
	365-Day Average	Highest 1-Hr Average	365-Day Average	Highest 1-Hr Average
Acrylonitrile	0.00027	NA	0.00019	NA
1,3-Butadiene	0.00030	NA	0.00023	NA
Benzene	0.00410	NA	0.00131	NA
Carbon Tetrachloride	0.01821	0.68397	0.03231	1.86082
1,4-Dioxane	0.02797	NA	0.02163	NA
Ethylene Dichloride	0.22429	NA	0.09146	NA
Ethylene Oxide	0.00335	NA	0.00614	NA
Cadmium	0.00026	NA	0.00010	NA
Lead	NA	0.00006	NA	0.00010
Formaldehyde	0.00420	0.04099	0.00148	0.02811
Gasoline Vapors	0.10384	NA	0.10101	NA
Isocyanates	0.04557	NA	0.02687	NA
Methylene Chloride	6.47759	170.45840	2.98300	155.01860
Nickel	0.00102	NA	0.00039	NA
Propylene Oxide	0.00001	NA	0.00001	NA
Perchloroethylene	0.25340	5.34472	0.10211	4.87080
Chlorine	0.13136	2.60253	0.01256	0.63679
Hydrogen Fluoride	0.00816	0.28956	0.00618	0.32478
Chlorofluorocarbons	10.52507	NA	5.58880	NA
Glycol Ether	0.99100	NA	0.44485	NA
Sodium Hydroxide	2.26950	NA	0.40710	NA
Phenol	0.01395	NA	0.03189	NA
Toluene	2.98644	NA	1.56704	NA
Manganese	0.00122	NA	0.00029	NA
Xylenes	2.49628	NA	1.04524	NA
Methyl Chloroform (1,1,1-TCA)	2.26672	NA	2.23988	NA
Methanol	0.07731	NA	0.09706	NA

NA = Not Applicable

3.3 CHARACTERIZATION OF RECEPTOR POPULATIONS

This section presents information regarding the receptor populations which may be exposed to emissions from the facility. Receptor populations are defined according to the activity in which they are engaged (*e.g.,* residential or occupational) within the potential zone of impact. Sensitive receptors were also identified in the potential zone of impact. Sensitive receptors may include individuals at chronic care facilities, hospitals, schools, and day care centers. In addition to identifying types of potential receptors, the size of the population was also estimated.

In order to characterize the receptors associated with this facility, Envirologic Data utilized the following tools: (1) detailed visual inspection of the area around the facility, (2) review of United States Geological Survey (USGS) topographical maps, (3) review of local street maps, (4) searches of telephone listings for private schools, day care centers, and chronic care facilities, and (5) review of census tract maps.

3.3.1 *Description of Exposed Populations*

In general, the receptor populations in the vicinity of the facility consist primarily of residents with some occupational receptors. The area is zoned for residential and light industrial land use.

3.3.1.1 *Residential Populations*

Based on 1990 census maps, the residential population of Riverside is approximately 226,505 individuals (City of Riverside, 1991). Adjacent residential populations are limited to the area south of the facility.

3.3.1.2 *Off-Site Occupational Populations*

In general, off-site occupational receptors are further removed from the facility than the nearest residential receptor. Light industry exists in the residential area to the west of the facility.

3.3.1.3 *Sensitive Populations*

Sensitive populations, as defined by CAPCOA (1991) and described in Section 3.3, were identified through review of USGS maps, street maps, and listings of facilities of interest. TABLES 3-3 and 3-4 present the facilities associated with potentially sensitive populations, their street addresses, telephone numbers, and UTM coordinates.

TABLE 3-2
SENSITIVE RECEPTORS:
SCHOOLS AND COLLEGES

Name of Facility	Address	Phone #	UTM	
			X	Y
Paradise Day School	No Listing	No Listing	457,700	3,756,200
Arlanza School	5891 Rutland Ave	351-9274	456,850	3,755,600
Foothill School	8230 Wells Ave	351-9264	457,400	3,754,800
Jackson School	4585 Jackson	788-7456	458,650	3,755,100
Wells School	10,000 Wells Ave	351-9241	456,800	3,754,550
Crest Haven School	No Listing	No Listing	456,400	3,755,700

TABLE 3-3
SENSITIVE RECEPTORS:
DAY CARE CENTERS

Name of Facility	Address	Phone #	UTM	
			X	Y
Paradise Day School	No Listing	No Listing	457,700	3,756,20

3.4 DESCRIPTION OF POTENTIAL EXPOSURE PATHWAYS

The following exposure pathways were assessed to determine the appropriateness of their use in this assessment:

(1) inhalation of emissions

(2) ingestion of soil

(3) dermal contact with soil

(4) ingestion of mother's milk

(5) ingestion of commercial or backyard crops

(6) ingestion of animal's milk

(7) ingestion of meat

(8) ingestion of drinking water

(9) ingestion of fish

(10) ingestion of groundwater

3.5 SELECTION OF POTENTIAL EXPOSURE PATHWAYS

To select potential exposure pathways for this assessment the type of chemicals emitted from the facility was determined. In addition, an evaluation of the land use in areas surrounding the facility was performed. By identifying the land use patterns of the area, potential exposure pathways appropriate for the facility were identified.

The type of chemicals emitted from the facility were evaluated in order to determine whether multipathway analysis was necessary. The California Air Pollution Control Officers Association's (CAPCOA) guidelines for AB 2588 risk assessments includes cadmium as a substance to be evaluated for non-carcinogenic non-inhalation exposure.

The majority of the area within two kilometers of the facility is zoned for residential and industrial use only. No agricultural land was identified in this area. One lake, Hole Lake, was identified in the area. According to the Santa Ana Water Quality Control Board, this lake is dry throughout the year (Smythe, 1991) and therefore is not used for any recreational or water storage purposes. In addition, it is not likely that migration of chemical emissions into groundwater will occur. Because of these findings the following exposure scenarios were not evaluated; ingestion of animal's milk, ingestion of meat, ingestion of drinking water, and ingestion of fish. No facility emitted chemicals are required to be evaluated for ingestion of mother's milk.

Therefore, this assessment evaluated potential exposures to all indicator chemicals via inhalation and exposure to cadmium via incidental ingestion, dermal contact with soil, and ingestion of homegrown crops.

3.6 CALCULATION OF EXPOSURE FROM THE INHALATION PATHWAY

Exposure from the inhalation pathway was evaluated for the residential and occupational MEI. This section presents an overview of these inhalation scenarios and the parameter values used in the analyses.

3.6.1 *Background to Inhalation of Chemicals*

The significance of this exposure scenario depends largely upon the inhalation rate of the receptor and the concentration of chemical in air. The LCE scenario presented in the following paragraphs utilizes hypothetical exposure parameters which are expected to provide conservative estimates of exposure. An alternative analysis which utilizes more realistic parameter values is presented in Appendix A. A spreadsheet which shows the calculations for this scenario is located in Appendix C.

3.6.2 *Description of Exposure Parameters*

A variety of exposure parameters are necessary to obtain an estimate of inhalation exposure: (1) the human inhalation rate, (2) the frequency and duration of exposure, (3) the chemical-specific absorption coefficient, (4) the body weight of the receptor, and (5) the concentration of chemical in air. A flow chart which describes this scenario is presented in FIGURE 3-1.

PARAMETER VALUES FOR RESIDENTIAL EXPOSURE

The human inhalation rate was assumed to be 0.83 m^3/hour. This value is based on data from ICRP (1981) for reference man and is consistent with EPA (1989a) and CAPCOA (1991) guidance. The average body weight for an adult, 70 kg, was used (ICRP, 1981; EPA, 1989a; CAPCOA, 1991). The absorption of chemicals from air into the lungs was conservatively assumed to be 100%. The estimated chemical-specific air concentrations were based on the results of the air dispersion modeling. The concentration of

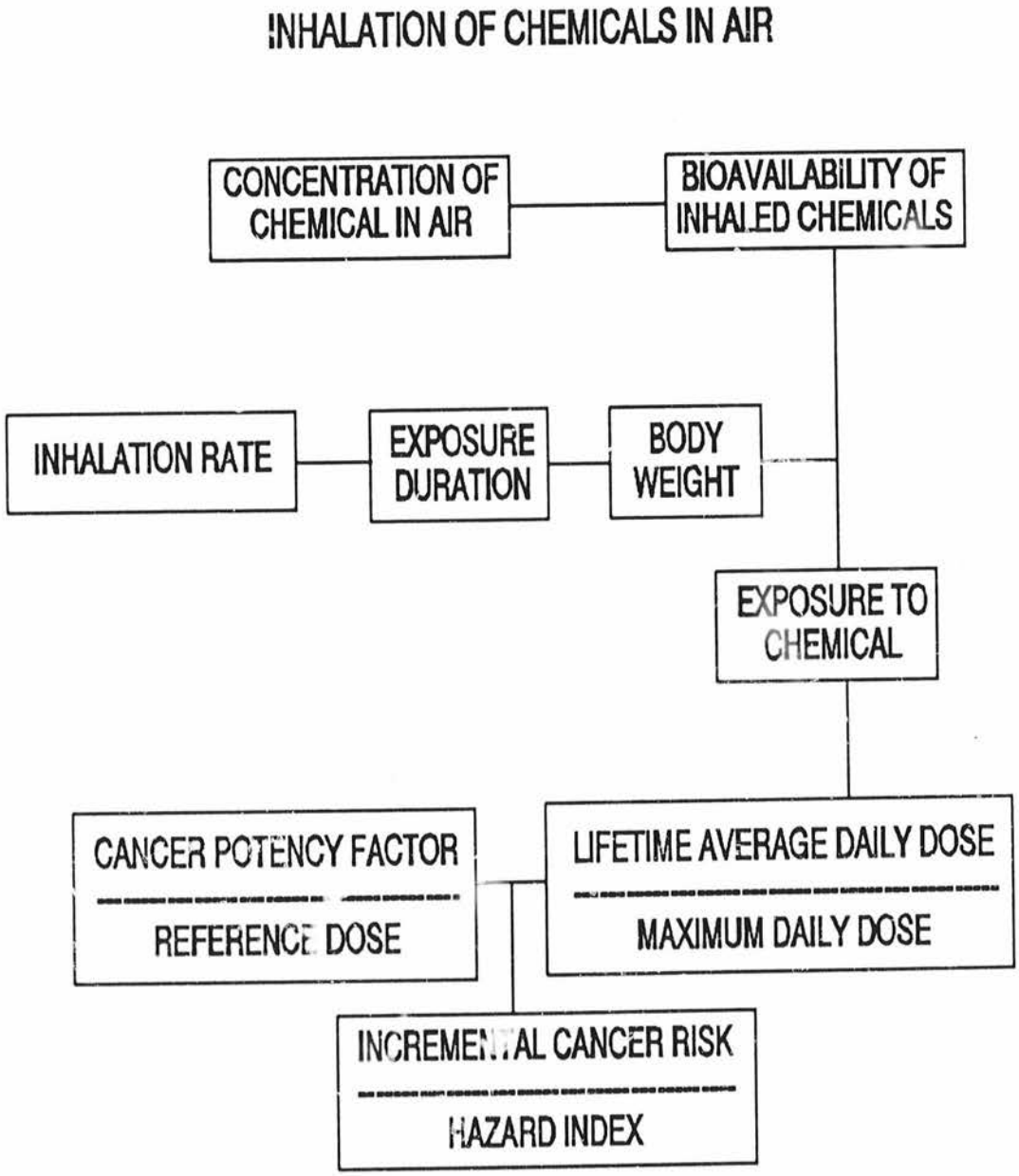
chemicals in air was determined through the use of computerized air dispersion modeling (ISCST).

The frequency of exposure was assumed to be 365 days per year. In addition, it was assumed that the receptor would be exposed 24 hours per day (168 hours per week). The duration of exposure was assumed to be 70 years. For this scenario the length of a lifetime was assumed to be 70 years (25,550 days) (CAPCOA, 1991).

PARAMETER VALUES FOR OCCUPATIONAL EXPOSURE

In accordance with the SCAQMD (1991), exposure to the occupational receptor was adjusted by a factor of 0.15. This adjustment factor corresponds to a exposure duration of 40 hours per week, 50 weeks per year, for 46 years. Human inhalation rate, body weight, absorption of chemicals, and the length of a lifetime were assumed to be equal to that of the residential receptor.

FIGURE 3-1



3.7 CALCULATION OF EXPOSURE FROM NON-INHALATION PATHWAYS

The non-inhalation pathways: Incidental Ingestion of Soil, Dermal Contact with Soil, and Ingestion of Homegrown Vegetables were evaluated for cadmium. CAPCOA (1991) requires that cadmium be evaluated for these multipathway exposures for chronic non-carcinogenic effects to residents.

3.7.1 *Potential Exposure to Chemicals through Soil Ingestion*

Receptors for the ingestion scenario may include residents who ingest small quantities of soil while working in yards and gardens. In addition, residents participating in recreational activities may ingest small quantities of soil. Since most of the yards in the area are landscaped, opportunities for exposure may be limited. However, Envirologic Data has concluded that this scenario may occur and therefore evaluated this scenario quantitatively.

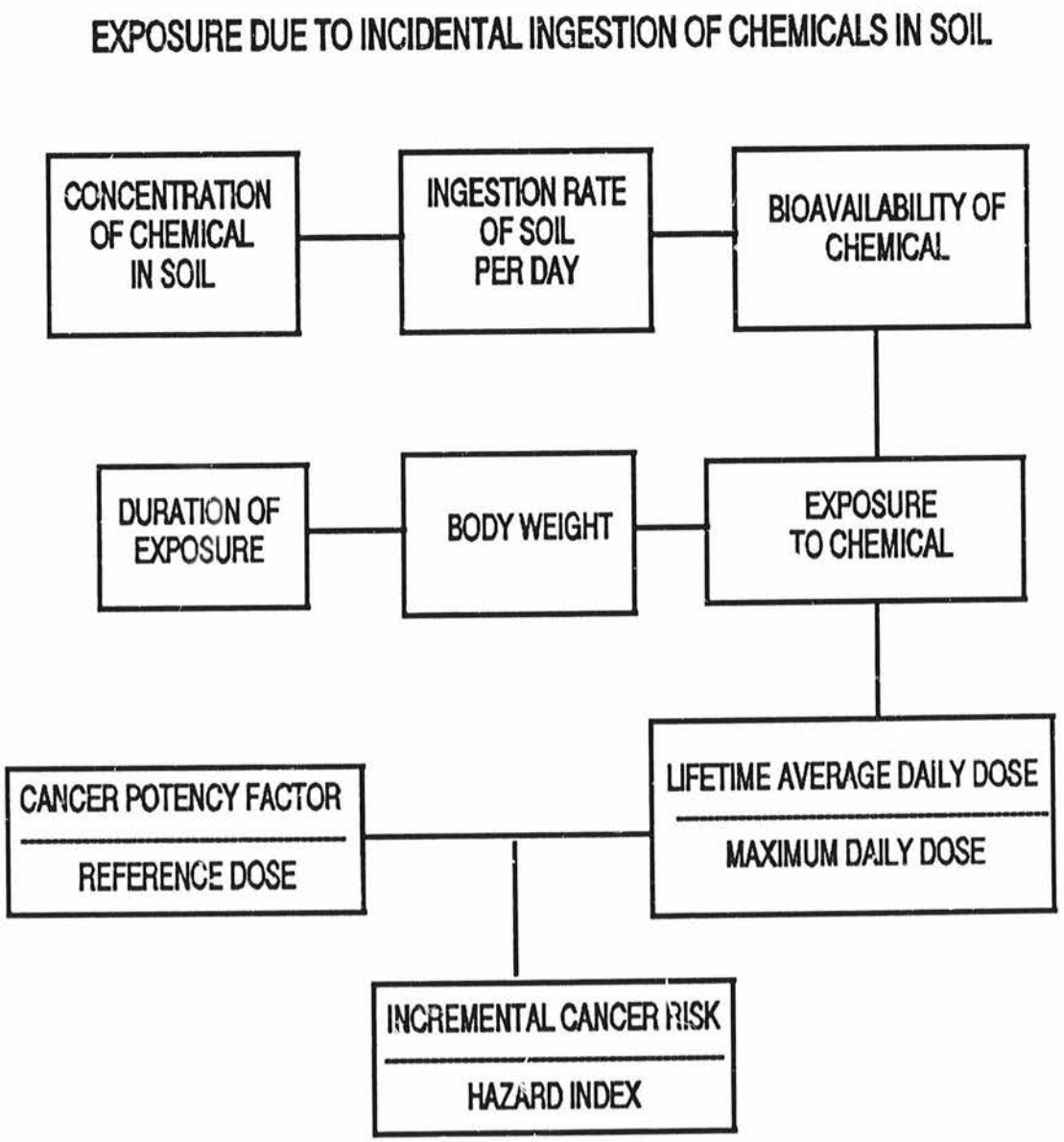
3.7.1.1 *Background to Ingestion of Chemicals in Soil*

The significance of this exposure scenario depends largely upon the amount of soil ingested and the frequency of the sensitive receptor's exposure to soil. The LCE scenario presented in the following paragraphs utilizes hypothetical exposure parameters which are expected to provide conservative estimates of exposure. An alternative analysis which utilizes more realistic parameter values is presented in Appendix A. A spreadsheet which shows the calculations for this scenario is located in Appendix C.

3.7.1.2. *Description of Exposure Parameters*

A variety of exposure parameters is necessary to obtain an estimate of exposure via the ingestion route. The parameters include (1) the amount of soil which an individual might ingest, (2) the bioavailability of a compound from soil, and (3) the exposure duration. A flow chart which describes this scenario is presented in FIGURE 3-2.

FIGURE 3-2



A body weight of 70 kilograms was used for the soil ingestion scenario. This weight represents the average body weight for adults (EPA, 1989a). Values for chemical specific absorption factors were taken from CAPCOA (1991).

This scenario reflects continuous exposure throughout a 70 year lifetime at a location where a receptor is present. Therefore, the exposure frequency is assumed to be 365 days per year for an exposure duration of 70 years. The soil ingestion rate is assume to be 150 mg/day (CAPCOA, 1991).

3.7.2. *Potential Exposure to Chemicals through Dermal Contact*

Receptors for the dermal contact scenario may include residents who come in contact with soil while gardening. In addition, residents participating in recreational activities may come into contact with soils. Since most of the yards in the area are landscaped, opportunities for exposure may be limited. However, Envirologic Data has concluded that this scenario may occur and therefore evaluated this scenario quantitatively.

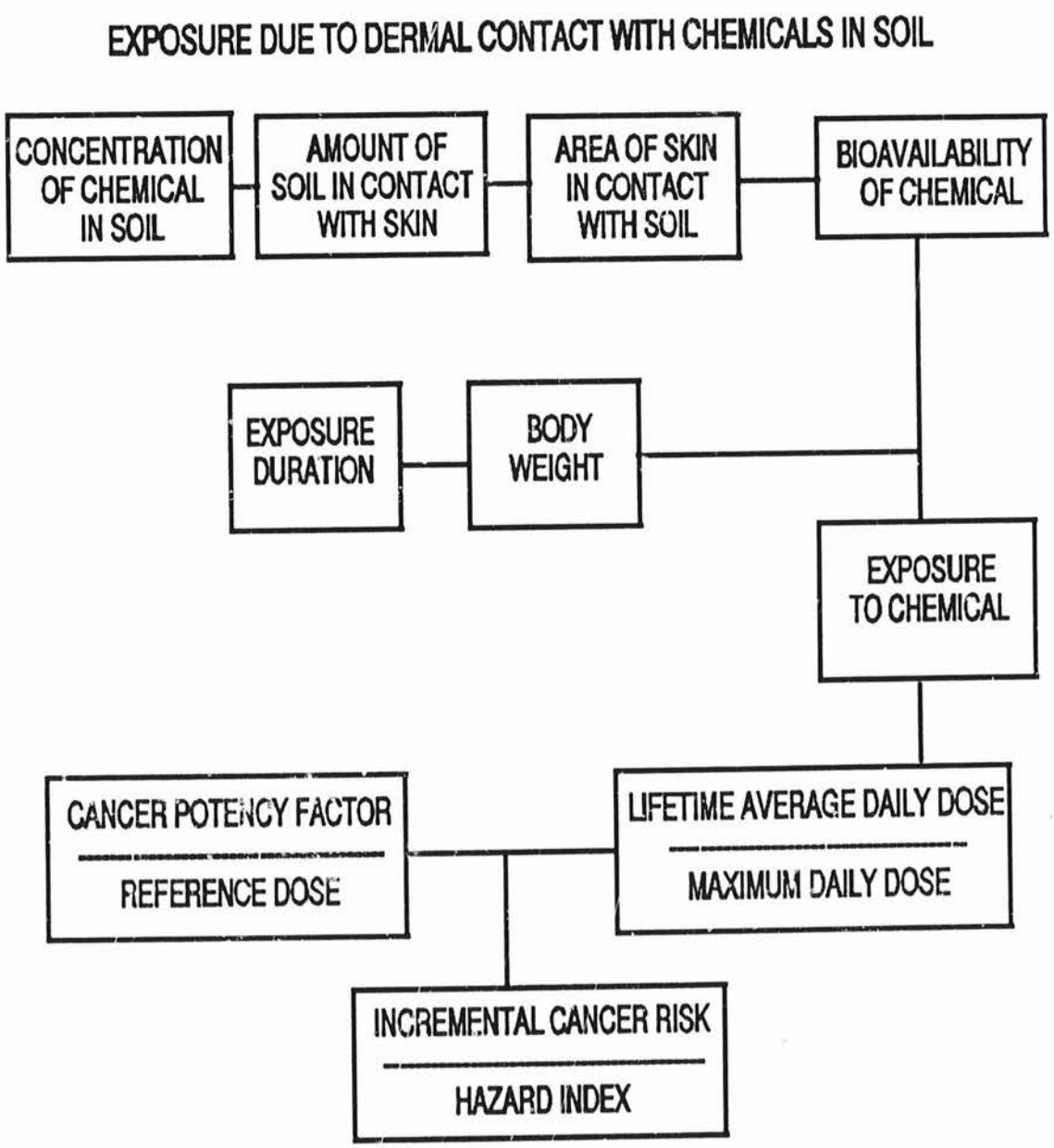
3.7.2.1 *Background to Dermal Contact with Soil*

The significance of this exposure scenario depends largely upon the surface area of exposed skin and frequency of the sensitive receptor's exposure to soil. The LCE scenario presented in the following paragraphs utilizes hypothetical exposure parameters which are expected to provide conservative estimates of exposure. An alternative analysis which utilizes more realistic parameter values is presented in Appendix A. A spreadsheet which shows the calculations for this scenario is located in Appendix C.

3.7.2.2 *Description of Exposure Parameters*

A variety of exposure parameters are necessary to obtain an estimate of exposure via the dermal route. These factors are (1) the amount of soil with which an individual might come in contact, (2) the soil adherence or soil loading factor, (3) the bioavailability, (4) exposed skin area, (5) the soil contact period, and (6) the exposure duration. A flow chart which describes this scenario is presented in FIGURE 3-3.

FIGURE 3-3



A body weight of 70 kilograms was used for the dermal contact scenario. This weight represents the average body weight for adults (EPA, 1989a). The soil loading factor was assumed to be 0.5 mg/cm^2-day for all exposure scenarios (CAPCOA, 1991). Values for chemical specific absorption factors were taken from CAPCOA (1991).

This scenario reflects continuous exposure throughout a 70 year lifetime at a location where a receptor is present. Therefore, the exposure frequency is assumed to be 365 days per year for an exposure duration of 70 years. Exposure parameters used for this scenario were taken from CAPCOA (1991). The exposed skin surface of the CAPCOA-mandated LCE is 4,656 cm^2.

3.7.3 *Potential Exposure to Chemicals through Ingestion of Homegrown Produce*

Receptors for the vegetable ingestion scenario may include residents who consume fruits and vegetables grown in backyard gardens. This can include residents who consume vegetables from their own gardens and residents who consume fruits and vegetables from other residents' gardens.

3.7.3.1 *Background to Ingestion of Homegrown Produce*

Exposure to chemicals in fruits or vegetables depends on the concentration in/on the vegetable and the amount consumed. Direct deposition of chemicals from the air onto the vegetable and root uptake of the chemical into the vegetable contributes to the total concentration. The LCE scenario presented in the following paragraphs utilizes hypothetical exposure parameters which are expected to provide conservative estimates of exposure. An alternative analysis which utilizes more realistic parameter values is presented in Appendix A. A spreadsheet which shows the calculations for this scenario is located in Appendix C.

3.7.3.2 *Description of Exposure Parameters*

A variety of exposure parameters are necessary to obtain a relevant estimate of exposure via the produce ingestion route. A flow chart which describes this scenario is presented in FIGURE 3-4.

The weathering constant of the soil represents the fraction of soil that is removed from the surface of the plants with time. The value used, 0.0495/day, was obtained from CAPCOA (1991).

The yield of crops represents the mass of vegetables or fruit that can be harvested from an area of soil. The value used, 2 kg/m^2, was obtained from California Department of Food and Agriculture maps as cited in CAPCOA, 1991.

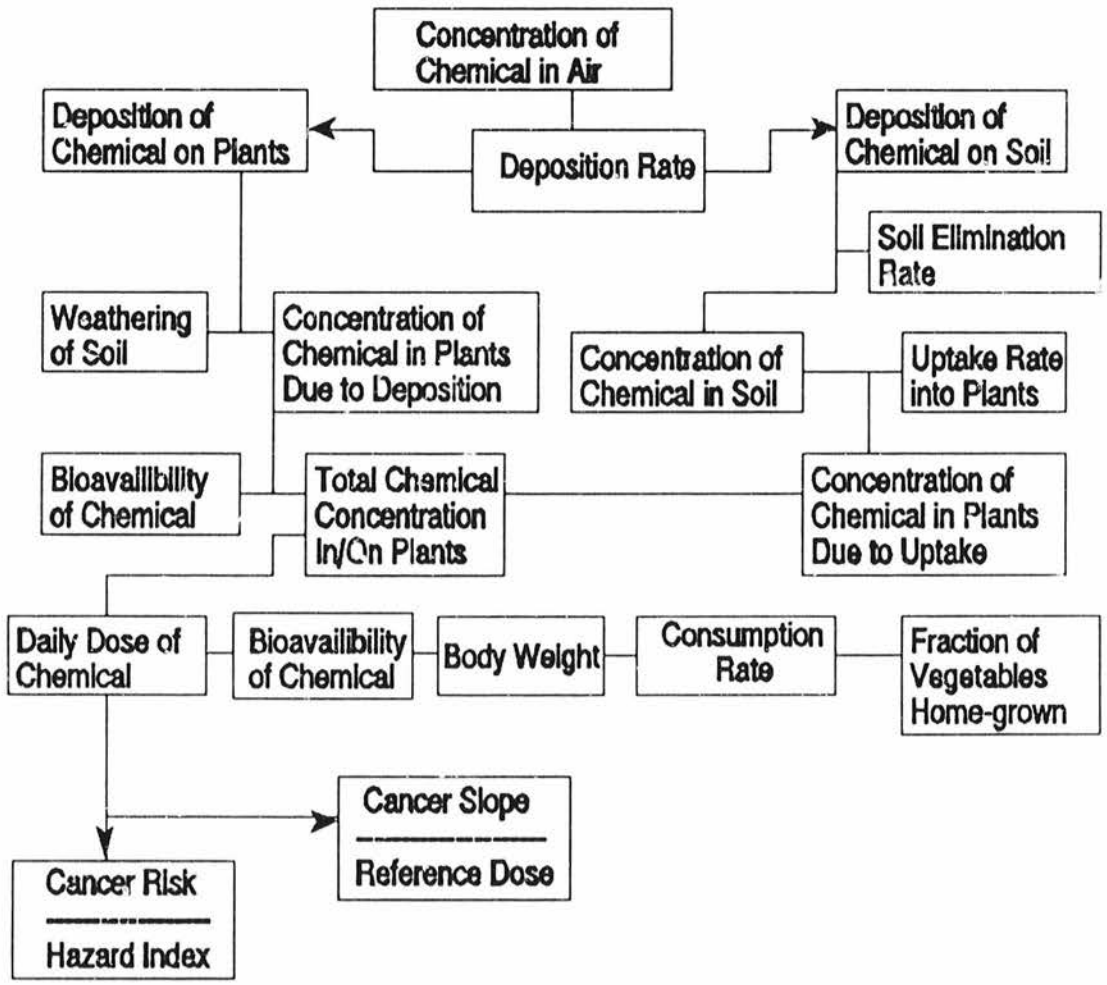
The total amount of produce consumed by residents was assumed to be 0.34 kg per day. This is an average value based on a national survey conducted by USDA (1980) as cited in EPA (1989a). This is slightly higher than the total default value of 0.31 listed in CAPCOA (1991) which does not include bananas or citrus juice.

A body weight of 70 kilograms was used for all the vegetable ingestion scenarios. This weight represents the average adult body weight (EPA, 1989a).

Chemical-specific parameters that were used included uptake factor, bioavailability factor, and gastrointestinal availability factor. The values for these parameters were obtained from CAPCOA (1991).

Fruits and vegetables are subject to deposition of particulates from the air which may contain chemicals. To determine the area that these fruits and vegetables occupy, a ratio between the edible exposed area of the produce and the area of the soil is derived. This ratio is called the interception fraction. Values for this fraction have been estimated for three types of crops: leafy, vine, and root (CAPCOA, 1991). For leafy crops, such as lettuce and cabbage, the edible area has been estimated to be 20% of the surface area. For vine crops, such as beans and tomatoes, this fraction has been estimated to be 10%.

FIGURE 3-4
EXPOSURE DUE TO INGESTION OF CHEMICALS IN HOMEGROWN VEGETABLES AND FRUITS



For root crops, such as potatoes and carrots, there is no exposure to deposition of particulates so the fraction is 0%. For the CAPCOA-mandated LCE exposure the greatest interception fraction, 0.2, was used (CAPCOA, 1991).

In estimating the uptake of chemicals from the soil an important parameter is the growth period of the produce. A longer growth period will allow more time for the plant to take up chemicals from the soil, so the concentration in the plant will have more time to reach an equilibrium condition with the soil concentration. A range for this parameter of 45 to 90 days was given in CAPCOA (1991). For the CAPCOA-mandated LCE exposure, the greatest value of 90 days was used.

Values for the fraction of homegrown produce consumed have been estimated for various types of vegetables and fruits (USDA, 1980 as cited in EPA, 1989a). Based on these data, the reasonable maximum homegrown fractions consumed for all vegetables and fruits are 40% and 30%, respectively. Thus a high value of 40% was used in the CAPCOA-mandated LCE exposure scenario.

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4.0 RISK CHARACTERIZATION

4.1 INTRODUCTION

Risk characterization is the process of quantifying potential human impacts For carcinogens, the lifetime incremental cancer risk (EPA, 1986) and the population cancer incidence or burden (CAPCOA, 1987) are presented. Non-cancer health risks from acute and chronic exposure to chemical emissions are represented by hazard indices. This risk assessment evaluated the following routes of exposure: (1) inhalation, (2) incidental ingestion of soil, (3) dermal contact with soil, and (4) ingestion of homegrown produce. These pathways were evaluated assuming the lifetime continuous exposure (LCE) mandated by CAPCOA (1991). Cancer risks and hazard indices are presented individually for the residential and occupational maximally exposed individual (MEI). Sensitive populations within the zone of impact have been identified (section 3.3.1.3) and risks for exposure to carcinogens these populations are presented per SCAQMD (1991) guidelines. A discussion of the assumptions used to quantify exposure and the associated uncertainties is included to provide insight into the degree to which numerical estimates are likely to reflect the true magnitude of risk (Section 4.5). The Conclusions of this risk assessment based on the results of the Risk Characterization are presented in Section 5.0.

4.2 LIFETIME INCREMENTAL CANCER RISK

4.2.1 *Calculation of Lifetime Incremental Cancer Risk*

Estimated human exposures to potential carcinogens through non-inhalation pathways are reported as a Lifetime Average Daily Dose (LADD). The LADD is an upper-bound estimate of the daily dose received by the receptor averaged over a lifetime. The cancer slope factor (formerly the cancer potency factor) is the quantitative relationship between the dose of a chemical and the probability of inducing a carcinogenic effect.

The LADD is used in conjunction with the cancer slope factor for the indicator chemical to estimate individual cancer risk according to the following equation:

$$Risk\ (noninhalation) = Cancer\ Slope\ Factor \times LADD$$

For inhalation exposure to AB 2588 listed carcinogens, the unit risk factor for the chemical is multiplied by the ambient air concentration (AAC) to estimate individual cancer risk according to the equation:

$$Risk\ (inhalation) = Unit\ Risk\ Factor \times AAC$$

The risk estimate can then be compared to the predetermined acceptable risk (Section 4.2.2).

4.2.2 *Acceptable Carcinogenic Risk*

The selection of an acceptable lifetime incremental cancer risk range is a risk-management decision. Many factors must be taken into consideration by the risk-manager in selecting an acceptable risk range. These factors include but are not limited to, other concurrent risks, exposed population size, and precedents for acceptable risk determinations. The purpose of this discussion is to provide information to the risk manager on past risk management decisions.

The determination of an acceptable risk range is a risk management decision and not the responsibility of the risk assessor. The components of risk assessment and risk management are to be kept separate in the overall design of risk analysis. Risk management considerations are not to be weighed in the risk assessment process. This separation of risk assessment and risk management can be maintained when risks are calculated based on measured chemical concentrations (*i.e.*, the calculation of risks are based on the site conditions). The calculated risks can then be compared to the chosen acceptable risks and a decision reached. The following discussion on the selection of an

acceptable risk is presented in order to provide the reader with information on past risk management decisions.

Based on a review of 132 federal agency records of decision (Travis *et al.*, 1987), acceptable environmental risks range from 1 x 10^{-4} (one in ten thousand) to 1 x 10^{-6} (one in one million). This review indicates that for large populations (*i.e.*, the general population of the U.S.A.) toxic agent exposures with corresponding individual risks of 1 x 10^{-4} or greater were always regulated and risks less than 1 x 10^{-6} were rarely regulated. In other words, if the individual risk exceeded 1 in 10,000 some action was taken to reduce that risk. On the other hand, with one exception, no action was taken to reduce large population exposures to toxic agents resulting in individual risks of 1 x 10^{-6} or less. When regulatory decisions have been made regarding small populations, the implied definitions of *de manifestis* (significant) and *de minimis* (insignificant) risks were different. For these small populations, "regulatory action was never taken for individual risk [with] ranges below 1 x 10^{-4}" (Travis, *et al.*, 1987).

Several states (*i.e.*, California, Minnesota, and Wisconsin) have been active in incorporating risk assessment into the regulatory process. These states have recommended the use of a lifetime acceptable risk range of 1 x 10^{-5} (MDH, 1985; CCR, 1986; WDNR, 1988). In California, the Proposition 65 risk range of 0 to 1 x 10^{-5} has been specified as acceptable or *de minimis*. Currently, Proposition 65 regulates any release which results in exposure to citizens of the state which exceed the 1 in 100,000 criteria. This acceptable risk is consistent with those federal decisions reviewed by Travis *et al.* (1987).

The SCAQMD has chosen 1 x 10^{-5} as a notification level (SCAQMD, 1991). Therefore, facilities which show impacts less than this level will not trigger public notification. According to the SCAQMD (1991), the actual notification levels have not yet been determined; however, 1 x 10^{-5} can be used to "decide if a facility should perform a more detailed analysis".

The lifetime incremental cancer risk (*e.g.*, 1×10^{-5}) is actualiy the upper bound of a range of risks. *The incremental risk range of 1 in 100,000 actually represents a risk range of between 0 and 1 in 100,000.* Therefore, it is not expected that for every one hundred thousand exposed individuals, one (in addition to the 30,000 background cancer rate) will develop cancer in his/her lifetime. With the numerous conservative assumptions which have been incorporated into this assessment, the risks are likely to be less than estimated.

4.2.3 *Carcinogenic Risk Results*

The lifetime continuous exposure (LCE) scenario is not representative of actual facility-related exposures. The LCE models exposure for 70 years, 365 days per year, for 24 hours per day for the MEI. The LCE risks for the residential and occupational MEI are presented in TABLE 4-1 for each potential carcinogen emitted by the facility. In accordance with CAPCOA (1991) guidance, risks calculated from screening unit risk factors are presented separately in TABLE 4-2. FIGURE 4-1 is pie-chart which presents the percent contribution of each chemical to the total risk for the LCE at the residential Maximally Exposed Individual (MEI).

Risks for sensitive receptors are also calculated using the 70 year continuous exposure. Risks for the sensitive receptors are presented in TABLES 4-3 and 4-4.

TABLE 4-1

LCE INCREMENTAL CANCER RISK BY INHALATION ROUTE

Chemical Name	RESIDENTIAL MEI	OCCUPATIONAL MEI
Acrylonitrile	7.8×10^{-8}	8.3×10^{-9}
1,3-Butadiene	8.4×10^{-8}	9.6×10^{-9}
Benzene	1.2×10^{-8}	5.7×10^{-9}
Carbon Tetrachloride	7.7×10^{-7}	2.0×10^{-7}
1,4-Dioxane	2.2×10^{-7}	2.5×10^{-8}
Ethylene Dichloride	4.9×10^{-6}	2.0×10^{-6}
Ethylene Oxide	3.0×10^{-7}	8.1×10^{-8}
Cadmium	1.1×10^{-6}	6.3×10^{-8}
Formaldehyde	5.5×10^{-8}	2.9×10^{-9}
Gasoline Vapors	8.8×10^{-8}	1.3×10^{-8}
Methylene Chloride	6.5×10^{-6}	4.5×10^{-7}
Nickel	2.5×10^{-7}	1.4×10^{-8}
Propylene Oxide	3.7×10^{-11}	5.6×10^{-12}
Perchloroethylene	1.5×10^{-7}	8.9×10^{-9}
Total	**1.5×10^{-5}**	**2.9×10^{-6}**

TABLE 4-2

LCE INCREMENTAL CANCER RISK BY INHALATION ROUTE (ANALYSIS FOR CHEMICALS WITH SCREENING UNIT RISK FACTORS)

Chemical Name	RESIDENTIAL MEI	OCCUPATIONAL MEI
Isocyanates	4.6×10^{-7}	4.0×10^{-8}

FIGURE 4-1

CONTRIBUTION OF EACH CHEMICAL TO TOTAL RISK

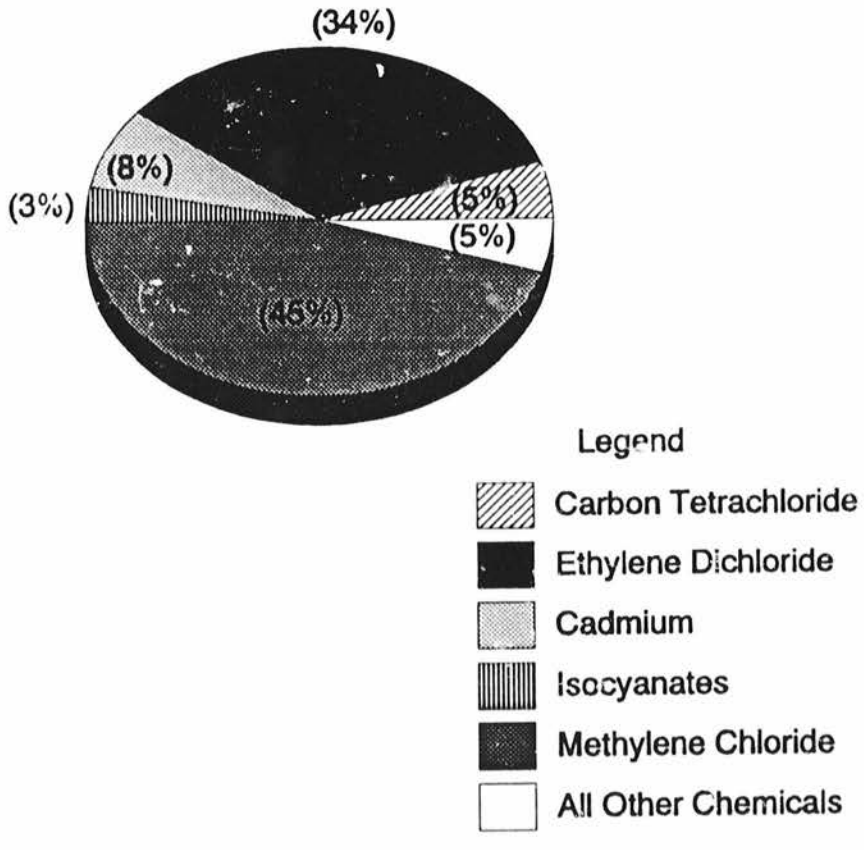

TABLE 4-3

LCE INCREMENTAL CANCER RISK BY INHALATION ROUTE FOR SENSITIVE RECEPTORS

Chemical Name	Crest Haven School	Wells School	Jackson School	Paradise Day School	Arlanza School	Foothill School
Acrylonitrile	1.5×10^{-8}	1.2×10^{-8}	1.2×10^{-8}	5.5×10^{-8}	2.0×10^{-8}	2.3×10^{-8}
1,3-Butadiene	2.5×10^{-3}	1.4×10^{-8}	1.4×10^{-8}	6.4×10^{-8}	3.1×10^{-8}	2.5×10^{-8}
Benzene	1.6×10^{-8}	1.2×10^{-7}	1.5×10^{-8}	1.4×10^{-6}	2.8×10^{-8}	1.9×10^{-8}
Carbon Tetrachloride	1.6×10^{-7}	1.0 x 10-7	9.9×10^{-8}	3.2×10^{-7}	4.6×10^{-7}	1.3×10^{-7}
1,4-Dioxane	4.4×10^{-8}	2.9×10^{-8}	3.9×10^{-8}	6.6×10^{-8}	7.6×10^{-8}	5.8×10^{-8}
Ethylene Dichloride	6.3×10^{-7}	4.0×10^{-7}	5.6×10^{-7}	5.7×10^{-7}	1.0×10^{-6}	7.7×10^{-7}
Ethylene Oxide	5.6×10^{-8}	3.9×10^{-8}	3.6×10^{-8}	1.2×10^{-7}	1.7×10^{-7}	4.8×10^{-8}
Cadmium	4.2×10^{-8}	4.2×10^{-8}	4.2×10^{-8}	8.4×10^{-8}	4.2×10^{-8}	4.2×10^{-8}
Formaldehyde	7.6×10^{-9}	5.7×10^{-9}	7.1 x 10-9	8.0×10^{-9}	1.4×10^{-8}	9.1×10^{-9}
Gasoline Vapors	1.3×10^{-8}	9.9×10^{-9}	1.3×10^{-8}	8.8×10^{-8}	2.1×10^{-8}	2.4×10^{-8}
Methylene Chloride	3.3×10^{-7}	2.1×10^{-7}	2.7×10^{-7}	5.7×10^{-7}	5.7×10^{-7}	4.2×10^{-7}
Nickel	7.2×10^{-9}	4.1×10^{-9}	7.2×10^{-9}	1.7×10^{-8}	1.4×10^{-8}	1.2×10^{-8}
Propylene Oxide	7.4×10^{-11}	0	3.7×10^{-11}	0	3.7×10^{-11}	3.7×10^{-11}
Perchloroethylene	8.0×10^{-9}	5.3×10^{-9}	7.5×10^{-9}	1.6×10^{-8}	1.4×10^{-8}	1.2×10^{-8}
Total	**1.4×10^{-6}**	**9.9×10^{-7}**	**1.1×10^{-6}**	**2.0×10^{-6}**	**2.5×10^{-6}**	**1.6×10^{-6}**

TABLE 4-4

LCE INCREMENTAL CANCER RISK BY INHALATION ROUTE FOR SENSITIVE RECEPTORS (ANALYSIS FOR CHEMICALS WITH SCREENING UNIT RISK FACTORS)

Chemical Name	Crest Haven School	Weils School	Jackson School	Paradise Day School	Arlanza School	Foothill School
Isocyanates	1.9×10^{-7}	9.3×10^{-8}	1.1×10^{-7}	2.5×10^{-7}	1.9×10^{-7}	1.9×10^{-7}

4.3 HAZARD INDICES

4.3.1 *Calculation of Hazard Indices*

Hazard Indices provide an indication of the potential for non-carcinogenic effects which may result from human exposures. For non-inhalation exposures, the HI is equal to the ratio of the Average Daily Dose (ADD) and the Reference Dose (RfD).

$$HI\ (noninhalation) = \frac{ADD\ (mg/kg\text{-}day)}{RfD\ (mg/kg\text{-}day)}$$

A MDD is the estimated maximum dose of a chemical, in milligrams per kilogram of body weight (mg/kg-day), to which an individual may be exposed under specified exposure conditions on a single day. The RfD, also expressed as mg/kg-day, is an estimate of a daily dose for a human population, including sensitive receptors, that is likely to be without risk of deleterious effects during a lifetime. The RfD is calculated from the AB 2583 AEL through the following equation.

$$RfD\ (mg/kg\text{-}day) = \frac{AEL\ (mg/m^3)\ x\ 20\ (m^3/day)}{70\ kg}$$

For inhalation exposure to AB 2588 listed non-carcinogens, the AAC is divided by the AEL to calculate the HI.

$$HI\ (inhalation) = \frac{AAC\ (mg/m^3)}{AEL\ (mg/m^3)}$$

4.3.2 *Acceptable Hazard Index*

Generally, an HI of 1.0 or less indicates that no adverse health effects are expected to occur; conversely, a HI of greater than 1.0 indicates that adverse health effects could occur in sensitive populations. An HI of 0.5 has been chosen by the SCAQMD as a notification level (SCAQMD, 1991). As with the risk level, the actual notification level

for HIs have not yet been determined; however, this value can be used to "decide if a facility should perform a more detailed analysis" (SCAQMD, 1991).

4.3.3 *Chronic Hazard Indices Results*

The chronic HI represents the potential for chronic non-carcinogenic effects in populations exposed to annual average concentrations of chemicals.

The lifetime continuous exposure (LCE) scenario is not representative of actual facility-related exposures. The LCE models exposure for 365 days per year for 24 hours per day at the MEI. The LCE HIs are presented in TABLE 4-5 for all chemicals which effect each toxicological endpoint. Values in this table include the multipathway exposures for cadmium. FIGURE 4-2 is a pie-chart which presents the percent contribution of each chemical to the total chronic hazard index for the respiratory system endpoint.

4.3.4 *Acute Hazard Indices Results*

The acute HI represents the potential for acute non-carcinogenic effects in populations exposed to the highest hourly concentrations of chemicals. The acute HIs for the residential and occupational MEI are presented in TABLE 4-6.

TABLE 4-5

LCE CHRONIC HAZARD INDICES BY RECEPTOR AND BY TOXICOLOGICAL ENDPOINT - TOTALED FOR ALL CHEMICALS

Receptor	Toxicological Endpoint						
	CV	CNS	IMM	KID	GI/LIV	REP	RESP
Residential MEI	0	0.027	0.0024	0.0039	0.026	0.099	1.1
Occupational MEI	0	0.0039	0.00022	0.00023	0.0058	0.010	0.096

CV = Cardiovascular System
CNS = Central Nervous System
IMM = Immunological
KID = Kidneys
REP = Reproductive
RESP = Respiratory

FIGURE 4-2

PERCENT CONTRIBUTION OF EACH CHEMICAL TO TOTAL CHRONIC HAZARD INDEX (RESPIRATORY SYSTEM ENDPOINT)

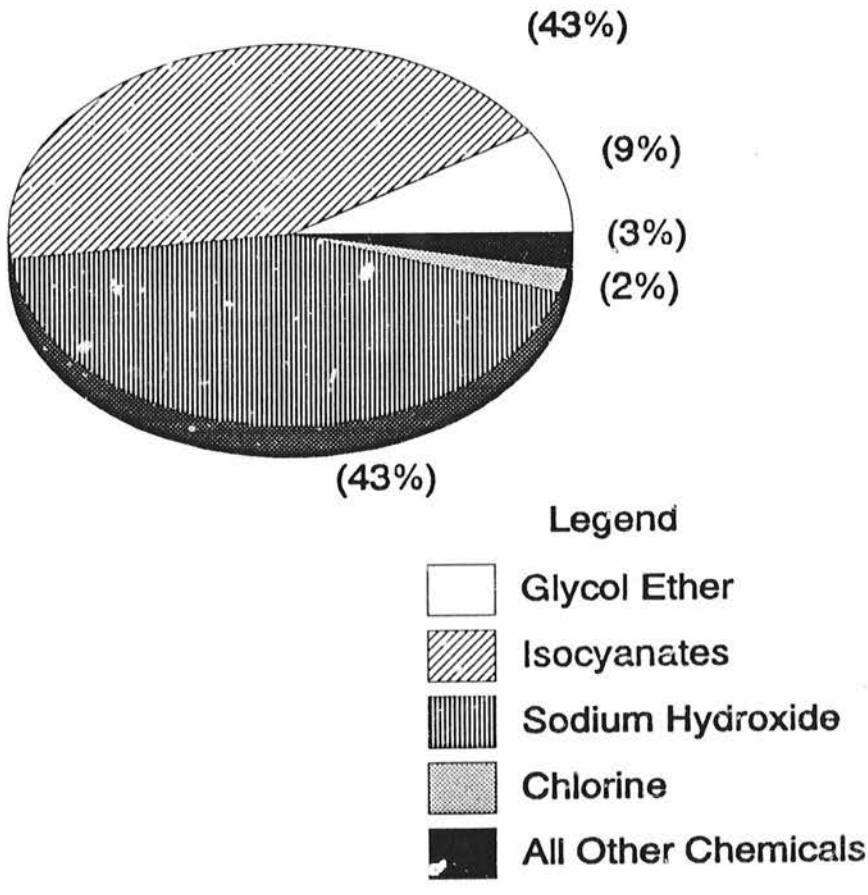

TABLE 4-6
ACUTE HAZARD INDICES

Chemical Name	RESIDENTIAL MEI	OCCUPATIONAL MEI
Carbon Tetrachloride	0.0036	0.0098
Formaldehyde	0.00011	0.000076
Methylene Chloride	0.049	0.044
Perchloroethylene	0.00079	0.00072
Chlorine	0.11	0.028
Hydrogen Fluoride	0.0005	0.0006
Lead	0.000040	0.000067
Total	**0.17**	**0.08**

NA = Not Applicable

4.4 POPULATION CANCER BURDEN

To assess the potential population-wide carcinogenic health risk posed by a facility, the total population excess cancer burden should be calculated (CAPCOA, 1991). The population excess cancer burden is an estimate of the increased number of cancer cases in a population which may potentially result from exposure to facility emissions (CAPCOA, 1991).

4.4.1 *Calculation of Population Cancer Burden*

The calculation of the population cancer burden for potentially exposed populations is based on predicted air concentrations of chemicals and the number of individuals potentially exposed to the emissions. An estimate of the number of individuals who may potentially be exposed to facility emissions is derived through analysis of census tract populations of the geographic area. The excess population cancer burden is the product of the population within each census tract and the estimated incremental risk which occurs at the centroid of each tract. Census tracts which are located within or intersect any part of the 1×10^{-6} risk isopleth are included in the calculation. The sum of the excess cancer burden for each tract yields an estimate of the total excess cancer burden for the facility.

4.4.2 *Population Cancer Burdens*

For the purpose of this assessment, the population cancer burden was calculated by multiplying 1×10^{-6} incremental cancer risk by the total population of the census tracts located within (or intersecting) the area of impact. This represents a more conservative approach than using the cancer risk at the centroid. This is because the centroid of each tract included in the evaluation is located outside the 1×10^{-6} risk isopleth and therefore would have a smaller risk. This approach was used because of the lack of modeled receptor points located at the area of most of the centroid points. The census tracts and the total populations based on 1990 census data are presented in APPENDIX C. The total population inhabiting these tracts is 37,119.

The hypothetical population cancer burden based on the incremental risk of the LCE exposure scenario is 0.04.

4.5 UNCERTAINTY ASSOCIATED WITH THIS ASSESSMENT

The duration, frequency, and intensity of potential exposures to toxic agents in various environmental matrices are evaluated when quantifying the dose received by potential receptors. Attempts are made to select parameter values which accurately reflect the actual site conditions. However, the absence of site-specific data requires that values for some exposure parameters be estimated. When it is necessary to estimate values, conservative estimates are used in order to insure the full protection of human and environmental health. Due to these conservative exposure estimates, the corresponding estimates of risk are conservatively high. A discussion follows regarding the conservatism associated with the exposure scenarios evaluated in this risk assessment.

4.5.1 *Uncertainty Associated with Environmental Fate Modeling*

The air dispersion model (ISCST) used to predict ambient air concentrations is inherently conservative in the prediction of ambient concentrations. Therefore, the concentrations predicted by this model are likely to overestimate the actual chemical concentrations present at any point. The use of conservative estimates of exposure point concentrations results in an overestimation of risks and hazard indices. In addition to the conservatism of the modeling techniques used there was also conservatism involved in quantification of emissions. Many of the emissions rates were based on emission factors. Currently, many emission factors are being reevaluated by the EPA (Rogers, 1991). The use of these conservative emission rates in the modeling result in elevated estimates of ambient air concentrations.

4.5.2 *Uncertainty in the Exposure Scenarios*

This section presents a summary of the assumptions used in the exposure assessment. The exposure pathway of primary concern in this assessment is the inhalation of emissions. The conservative parameters used in the inhalation scenario include: (1) the assumption that the uptake of chemicals from the air into the lungs is 100%, and (2) the LCE scenario (which is a worst case scenario) involves continuous exposure throughout an individual's life (365 days per year, 24 hours per day for 70 years).

4.6 REFERENCES

CAPCOA. 1991. *Air Toxics "Hot Spots" Program Risk Assessment Guidelines.* Prepared by the AB 2588 Risk Assessment Committee of the California Air Pollution Control Officers Association (CAPCOA) in Consultation with the Air Toxicology Unit, Air Toxicology and Epidemiology Section, Department of Health Services and Energy Projects Section, Project Assessment Branch, Air Resources Board.

CAPCOA. 1987. *Toxic Air Pollutant source Assessment Manual for california Air Pollution Control Districts and Applicants for Air Pollution Control District Permits.* Prepared by the Interagency Working Group. Berkeley, CA.

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Travis, C.C, S.A. Richter, E.A. Crouch, R. Wilson, and E. Wilson. 1987. *Cancer Risk Management. A Review of 132 Federal Regulatory Decisions.* Environ. Sci. Technol. 21(5):415-420.

WDNR. 1988 *Water Quality Criteria for Toxics.* Number 105. Wisconsin Department of Natural Resources. May.

5.0 CONCLUSIONS

This report evaluated the potential health risks associated with emissions from the Rohr, Inc. Riverside Facility as required by AB 2588. Estimated emissions from the approved Air Toxics Inventory Report (ATIR) were used as input for the air dispersion model ISCST. This model was used to estimate the ambient air concentrations at points on a 100 meter grid. The estimated ambient air concentrations were used to estimate exposure and subsequent potential cancer and non-cancer health effects.

Based on the presence of residential receptors, the types of compounds emitted from the facility, and other factors affecting potential exposures, the following exposure pathways were evaluated: (1) inhalation of chemicals, (2) incidental ingestion of soils, (3) dermal contact with soils, and (4) ingestion of homegrown crops. Exposure through these pathways were estimated at the point of maximum impact (PMI) where there exists a residential receptor, also referred to as the residential maximally exposed individual (MEI). Exposure to the residential MEI was based on CAPCOA mandated assumptions which constitute the Lifetime Continuous Exposure (LCE). This means that it was assumed residents would be exposed to facility emissions at the same location, 24 hours per day, 365 days per year, for 70 years. Exposure to sensitive receptors was also evaluated using the LCE. In addition, exposure through inhalation was evaluated for the occupational MEI. For occupational individuals (those in the work place) this exposure was adjusted for working hours as recommended by CAPCOA using an adjustment factor of 0.15. This adjustment factor correlates to an exposure equal to 40 hours per week, 50 weeks per year, for 46 years. In addition to the CAPCOA mandated evaluation, an alternative evaluation which utilizes more realistic exposure parameters is presented in APPENDIX A.

It should be noted that the results of the risk assessment should be used with caution. As stated in the 1991 CAPCOA Risk Assessment Guidelines "... the risk levels generated in a risk assessment are useful as a yardstick to compare one source with another and prioritize concerns. Risk estimates generated by a risk assessment should not be construed as the expected rates of disease in the exposed population but are merely estimates of risk, based on current knowledge and a large number of assumptions. In

addition, the estimates of risk generated by risk assessments frequently are with reference to a maximally exposed person".

The results of this analysis indicate that for residential exposure:

1) The total LCE risk for potential exposure to facility emitted chemicals is above the notification level of 1×10^{-5}.

2) All chronic non-cancer hazard indices are below the notification level of 0.5 except for respiratory effects. Sodium hydroxide and isocyanates contribute 86% to the total HI for respiratory effects.

3) All acute non-cancer hazard indices are below the notification level of 0.5.

(4) The estimated cancer burden is below the level of 1.0. This indicates that no cancer cases will occur due to facility emissions.

The results of this analysis indicate that for occupational exposure:

1) The total LCE risk for potential exposure to facility emitted chemicals is below the notification level of 1×10^{-5};

2) All chronic non-cancer hazard indices are below the notification level of 0.5.

3) All acute non-cancer hazard indices are below the notification level of 0.5.

Based on the results of this risk assessment, Envirologic Data concludes that estimated cancer health risks associated with residential exposure to facility emissions are above the notification level of 1×10^{-5} as presented in the SCAQMD guidelines. Estimated cancer health risks for occupational receptors are below the notification level. In addition, with the exception of the total HI for respiratory effects, all HIs are less than the notification level of 0.5 for a hazard index. It should be noted that for respiratory effects, sodium hydroxide and isocyanates emissions together result in approximately 90%

of the total HI. Due to the many conservative assumptions incorporated into this assessment, the actual risks and hazard indices for all chemicals are probably lower than estimated. Appendix A presents an alternative analysis which provides a range of risk estimates and an indication of the uncertainty associated with this assessment.

FINAL

APPENDIX A

ALTERNATIVE ANALYSIS

A.1 INTRODUCTION TO THE ALERNATIVE EVALUATION/UNCERTAINTY ANALYSIS

In the assessment presented in this report, CAPCOA-mandated default values were used in estimating exposures and risks associated with facility emissions. In this section, exposure parameter values which provide more realistic estimates of risk were used in order to provide an indication of uncertainty in this assessment. Exposure assumptions were modified utilizing current EPA risk assessment methodology in order to provide more realistic estimates of the risks associated with emissions from the facility (EPA, 1989a; 1989b). Additionally, the alternative evaluation did not include the ethylene dichloride (EDC) emissions in the compilation of risk and HI estimates. This is due to the fact that the use of EDC has been eliminated at the facility since July, 1990, after the submission of the ATIR.

A.2 ALTERNATIVE EXPOSURE ASSESSMENT

Two alternative exposure scenarios that employ more realistic exposure parameters were evaluated. These additional exposure scenarios include the average exposure and reasonable maximum exposure (RME) which take into account data on durations of residency and other parameters. The LCE residential scenario involves continuous exposure throughout an individual's life at a specified receptor location. This assumes that an individual remains at this location 365 days/year, 24 hours/day for 70 years. This scenario is unrealistic since during an individual's lifetime they would be expected to leave their place of residence for short periods of time (*i.e.,* to go to work or school or shopping), or for prolonged periods of time (*i.e.*, to travel, or attend school). Additionally it assumes that a person is born, grows up, and lives their entire adult life at the same location. EPA (1989a) recommends an average duration of exposure of 9 years and a RME duration of 30 years based on the national 50th and 90th percentiles of time spent at a single residence, respectively. For the average exposure scenario, most-likely or 50th-percentile values are used for exposure parameters such as inhalation rates and exposure duration. In the RME scenario, maximum-plausible or 95th-percentile values are used for exposure parameters.

A.2.1 *Calculation of Exposure From the Inhalation Pathway*

A.2.1.1 *Background to Inhalation of Chemicals*

The significance of this exposure scenario depends largely upon the inhalation rate of the receptor and the concentration of chemical in air. Based on the presence of residential receptors, this pathway was evaluated for residents.

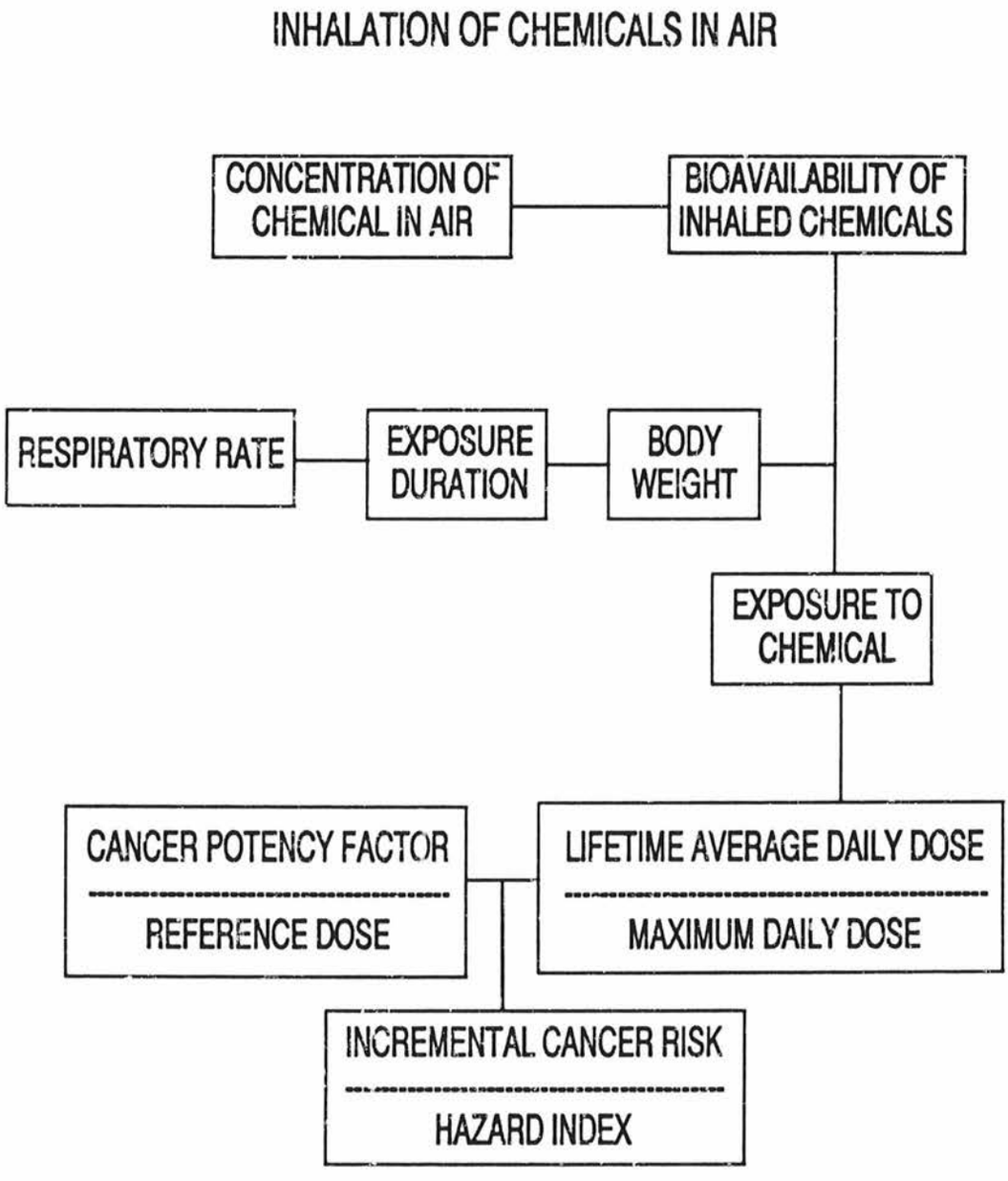
A.2.1.2 *Description of Exposure Parameters*

A variety of exposure parameters are necessary to obtain an estimate of inhalation exposure: (1) the human inhalation rate, (2) the frequency and duration of exposure, (3) the absorption coefficient, (4) the body weight of the receptor, and (5) the concentration of chemical in air. Parameter values unique to each of the alternative scenarios (the RME and average exposure) are presented. Exposure parameters common to the RME and the average exposure scenarios are also presented. A flow chart which describes this scenario is presented in FIGURE A-1.

COMMON EXPOSURE PARAMETER VALUES

Exposure parameter values common to the RME and average exposure scenarios include respiration rate, body weight, absorption coefficient, and concentration in air. The respiration rate was assumed to be 0.83 m^3/hour. This value is based on data from ICRP (1981) for reference man and is consistent with EPA (1989a) and CAPCOA (1991) guidance. The average body weight for an adult, 70 kg, was used (ICRP, 1981; EPA, 1989a; CAPCOA, 1991). The absorption of chemicals from air into the lungs was conservatively assumed to be 100%. The estimated chemical-specific air concentrations were based on the results of the air dispersion modeling. The concentration of chemicals in air was determined through the use of computerized air dispersion modeling (ISCST) (EPA, 1986).

FIGURE A-1



RME EXPOSURE PARAMETER VALUES FOR ALTERNATIVE EVALUATION

Parameter values specific to the RME scenario include the duration and frequency of exposure and the assumed length of a "lifetime". As with the CAPCOA-mandated LCE scenario, the frequency of exposure was assumed to be 365 days per year. However, it was assumed that the RME receptor would be outside the potential zone of impact while at work or otherwise away from the home. Therefore, the receptor would be potentially exposed 16 hours per day for five days per week, and 24 hours per day for 2 days per week; this translates to 128 hours per week. This value is more conservative than the mean duration spent at home of 107.59 hours per week (EPA, 1989a). The duration of exposure for the RME scenario was assumed to be 30 years. This value is based on the national upper 90th percentile time spent at a single residence (EPA, 1989a). The lifetime of the receptor was assumed to be 75 years (27,375 days) (EPA, 1989a).

AVERAGE EXPOSURE PARAMETER VALUES FOR ALTERNATIVE EVALUATION

Parameter values specific to the average exposure scenario include the duration and frequency of exposure and the assumed length of a "lifetime". The frequency of exposure for the average exposure scenario was assumed to be 350 days per year. This was based on the assumption that the receptor would spend two weeks per year away from home. It was also assumed that the average receptor would be outside the potential zone of impact while at work. Therefore, the receptor would be potentially exposed 16 hours per day, five days per week, and 24 hours per day, 2 days per week; this translates to 128 hours per week. This value is more conservative than the mean duration spent at home of 107.59 hours per week (EPA, 1989a). A 9 year exposure duration is based on the national 50th percentile time spent at a single residence (EPA, 1989a). The lifetime of the receptor was assumed to be 75 years (27,375 days) based on guidance in the Exposure Factors Handbook (EPA, 1989a).

A.2.2 *Potential Exposure to Cadmium through Soil Ingestion*

Receptors for the ingestion scenario may include residents who ingest small quantities of soil while working in yards and gardens. In addition, residents participating in recreational activities may ingest small quantities of soil. Since most of the yards in the area are landscaped, opportunities for exposure may be limited. However, Envirologic Data has concluded that this scenario may occur and therefore evaluated this scenario quantitatively.

A.2.2.1 *Background to Ingestion of Cadmium in Soil*

The significance of this exposure scenario depends largely upon the amount of soil ingested and the frequency of the sensitive receptor's exposure to soil.

A.2.2.2. *Description of Exposure Parameters*

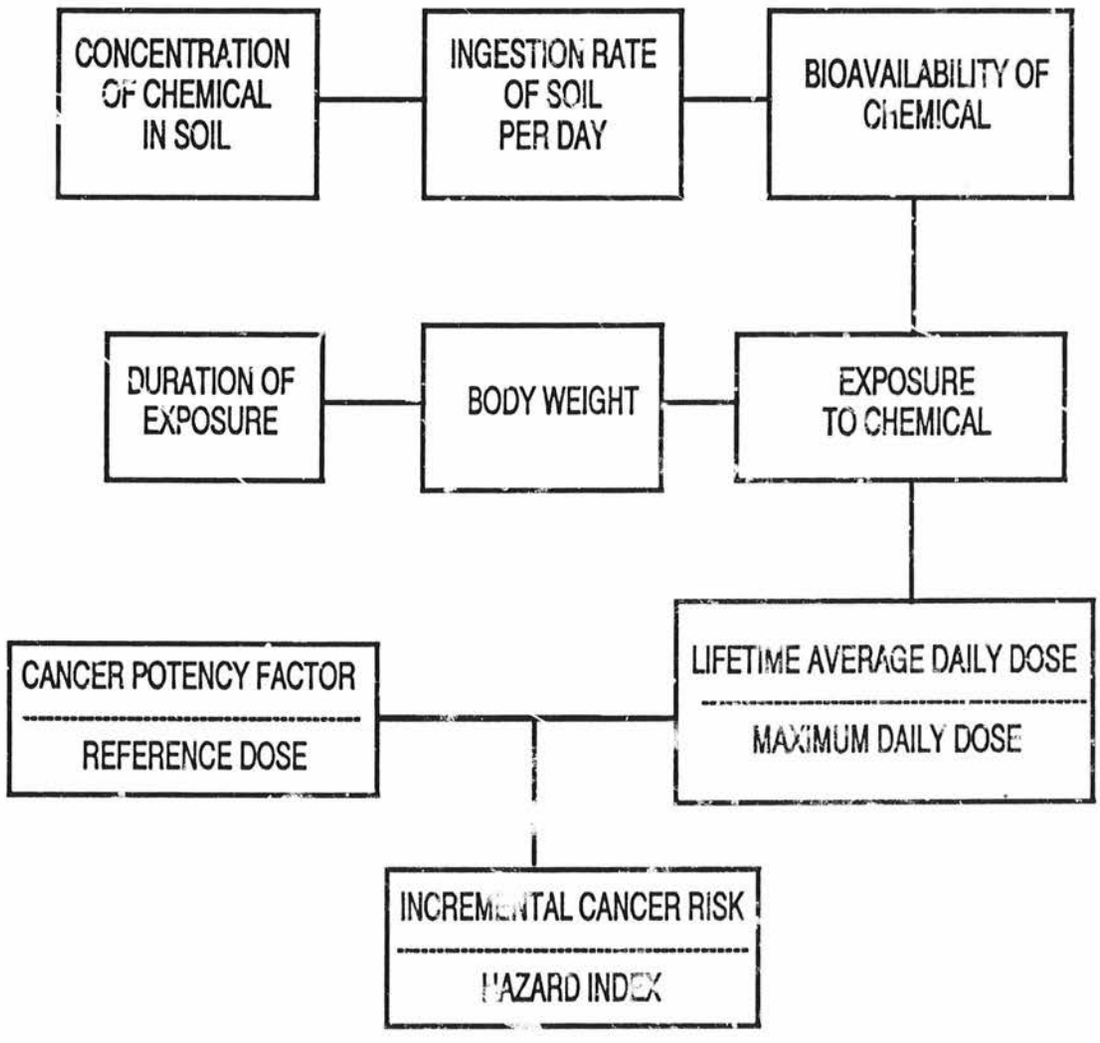
A variety of exposure parameters is necessary to obtain an estimate of exposure via the ingestion route. The parameters include (1) the amount of soil which an individual might ingest, (2) the bioavailability of a compound from soil, and (3) the exposure duration. Exposure parameters were developed to represent the RME and the average exposure and are presented in the following paragraphs. Exposure parameters common to both scenarios are also presented. A flow chart which describes this scenario is presented in FIGURE A-2.

COMMON EXPOSURE PARAMETERS

A body weight of 70 kilograms was used for the soil ingestion scenarios. This weight represents the average body weight for adults (EPA, 1989a). Values for chemical specific absorption factors were taken from CAPCOA (1991). A value of 100 mg/day was used for the soil ingestion rate for the RME scenario. This value is based on the ingestion rate recommended by Risk Assessment Guidance for Superfund (EPA, 1989b) for age groups greater than 6 years. A soil ingestion rate of 100 mg/day was also used for the average exposure.

FIGURE A-2

EXPOSURE DUE TO INCIDENTAL INGESTION OF CHEMICALS IN SOIL



RME EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

An exposure frequency of one day per week (*i.e.*, one day per weekend) or 52 days per year was used for the RME exposure scenario. It was also assumed that the exposure would occur for 30 years of an individuals' lifetime of 75 years (EPA, 1989a). The 30 year estimate is the national upper bound (90th percentile) value for the amount of time spent at one residence (EPA, 1989a).

AVERAGE EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

An exposure frequency of 1 day every other week or 26 days per year was used for the average exposure. It was assumed that this exposure would continue for 9 years of an individuals lifetime of 75 years (EPA, 1989a). The 9 year estimate is the national average (50th percentile) value for the amount of time spent at one residence (EPA, 1989a).

A.2.3. *Potential Exposure to Cadmium through Dermal Contact with Soils*

Receptors for the dermal contact scenario may include residents who come in contact with soil while gardening In addition, residents participating in recreational activities may come into contact with soils. Since most of the yards in the area are landscaped, opportunities for exposure may be limited. However, Envirologic Data has concluded that this scenario may occur and therefore evaluated this scenario quantitatively.

A.2.3.1 *Background to Dermal Contact with Soil*

The significance of this exposure scenario depends largely upon the surface area of exposed skin and frequency of the sensitive receptor's exposure to soil.

A.2.3.2 *Description of Exposure Parameters*

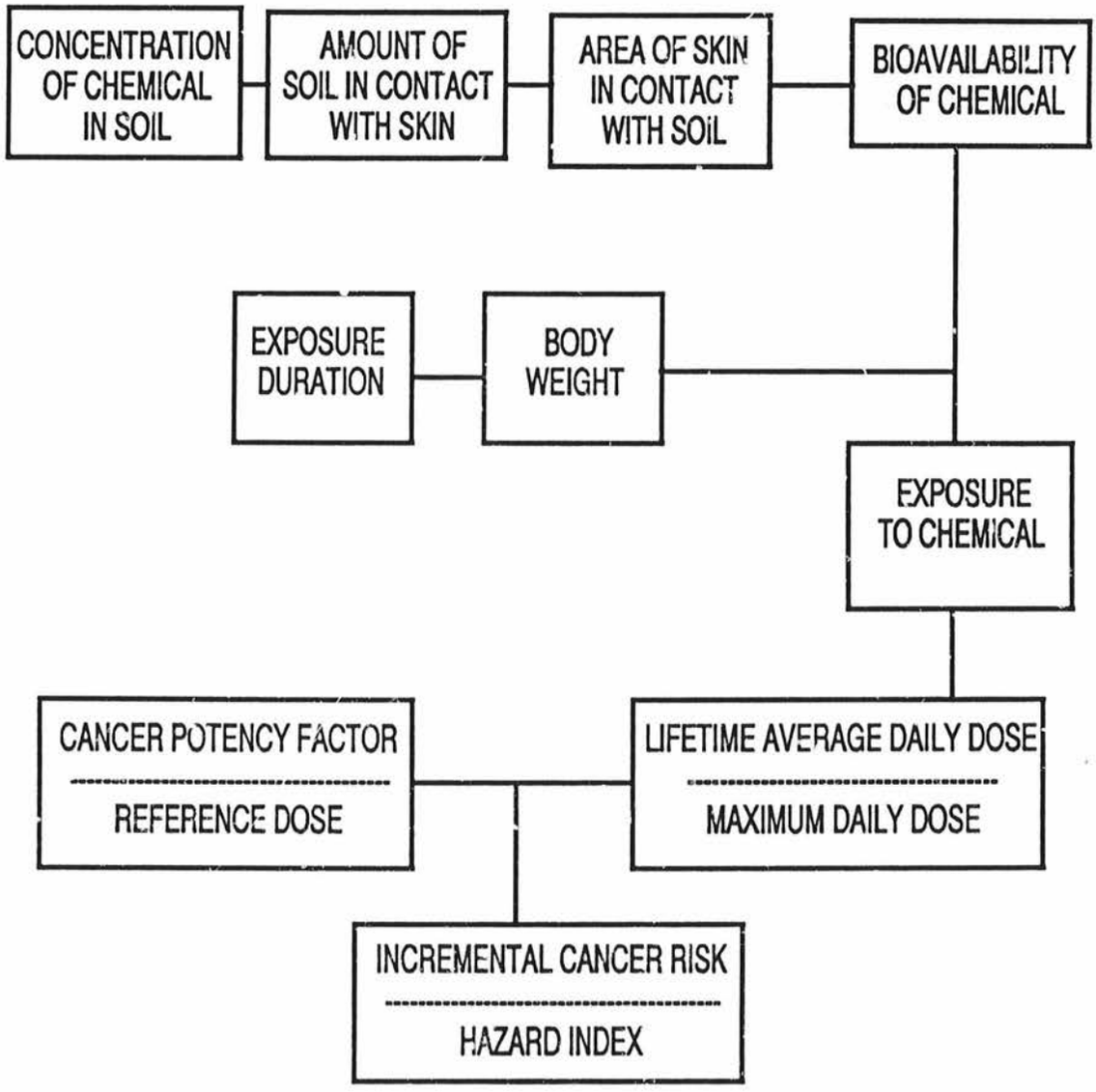
A variety of exposure parameters are necessary to obtain an estimate of exposure via the dermal route. These factors are (1) the amount of soil with which an individual might come in contact, (2) the soil adherence or soil loading factor, (3) the bioavailability, (4) exposed skin areas, (5) the soil contact period, and (6) the exposure duration. A flow chart which describes this scenario is presented in FIGURE A-3.

COMMON EXPOSURE PARAMETERS

A body weight of 70 kilograms was used for the dermal contact scenarios. This weight represents the average body weight for adults (EPA, 1989a). The soil loading factor was assumed to be 0.5 mg/cm^2-day for both exposure scenarios (CAPCOA, 1991). Values for chemical specific absorption factors were taken from CAPCOA (1991).

FIGURE A-3

EXPOSURE DUE TO DERMAL CONTACT WITH CHEMICALS IN SOIL



RME EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

For the RME exposure scenario, it was assumed that the receptor would wear shorts and short sleeve shirts when engaged in outdoor activities. Therefore, the skin of the hands, forearms, and lower legs would be exposed to soil. The skin surface area of 4,050 cm^2 was estimated for these body parts for the average adult male (EPA, 1989a).

An exposure frequency of one day per week (*i.e.*, one day per weekend) or 52 days per year was used for the RME exposure scenario. It is also assumed that the exposure would occur for 30 years of an individual's lifetime of 75 years (EPA, 1989a). The 30 year estimate is the national upper bound (90th percentile) value for the amount of time spent at one residence (EPA, 1989a).

AVERAGE EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

For the average scenario, it was assumed that the receptor would wear long pants and short sleeve shirts while engaged in outdoor activities. Therefore, the skin of the hands and forearms would be exposed to soil. The skin surface area of these body parts was estimated to be 1,980 cm^2 for the average male (EPA, 1989a).

An exposure frequency of 1 day every other week or 26 days per year was used for the average exposure. It was assumed that this exposure would continue for 9 years of an individual's lifetime of 75 years (EPA, 1989a). The 9 year estimate is the national average (50th percentile) value for the amount of time spent at one residence (EPA, 1989a).

A.2.4 *Potential Exposure to Cadmium through Ingestion of Homegrown Produce*

Receptors for the vegetable ingestion scenario may include residents who consume fruits and vegetables grown in backyard gardens. This can include residents who consume vegetables from their own gardens and residents who consume fruits and vegetables from other residents' gardens.

A.2.4.1 *Background to Ingestion of Homegrown Produce*

Exposure to chemicals in fruits or vegetables depends on the concentration in/on the produce and the amount of produce consumed. Direct deposition of chemicals from the air onto the produce and root uptake of the chemical into the produce contributes to the total concentration of chemical in/on the produce.

A.2.4.2 *Description of Exposure Parameters*

A variety of exposure parameters are necessary to obtain a relevant estimate of exposure via the produce ingestion route. Exposure parameters were developed to represent the RME and the average exposure and are presented in the following paragraphs. Exposure parameters common to both scenarios are also presented. A flowchart which describes this scenario is presented in FIGURE A-4.

COMMON EXPOSURE PARAMETERS

Common parameter values include the weathering constant, the crop yield, the amount of produce consumed, the body weight, and chemical specific parameters including the uptake factor, the bioavailability factor, and the gastrointestinal factor.

The weathering constant of the soil represents the fraction of soil that is removed from the surface of the plants with time. The value used, 0.0495/day, was obtained from CAPCOA (1991).

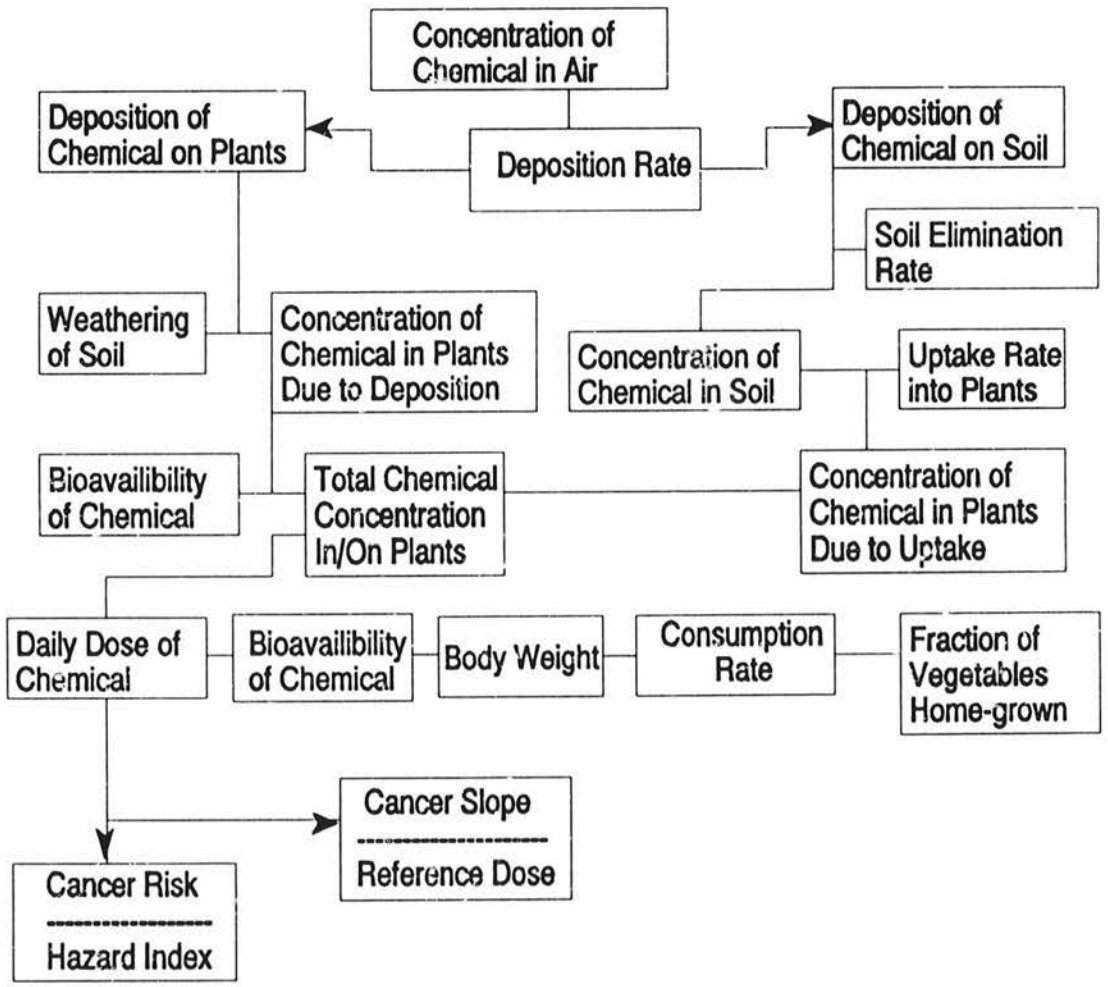
The yield of crops represents the mass of vegetables or fruit that can be harvested from an area of soil. The value used, 2 kg/m^2, was obtained from California Department of Food and Agriculture maps as cited in CAPCOA, 1991.

The total amount of produce consumed by residents was assumed to be 0.34 kg per day. This is an average value based on a national survey conducted by USDA (1980) as cited in EPA (1989a). This is slightly higher than the total default value of 0.31 listed in CAPCOA (1991) which does not include bananas or citrus juice.

A body weight of 70 kilograms was used for all the vegetable ingestion scenarios. This weight represents the average adult body weight (EPA, 1989a).

FIGURE A-4

EXPOSURE DUE TO INGESTION OF CHEMICALS IN HOMEGROWN VEGETABLES AND FRUITS



Chemical-specific parameters that were used included uptake factor, bioavailability factor, and gastrointestinal availability factor. The values for these parameters were obtained from CAPCOA (1991).

Fruits and vegetables are subject to deposition of particulates from the air which may contain chemicals. To determine the area that these fruits and vegetables occupy, a ratio between the edible exposed area of the produce and the area of the soil is derived. This ratio is called the interception fraction. Values for this fraction have been estimated for three types of crops: leafy, vine, and root (CAPCOA, 1991).

RME EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

For the RME exposure it was assumed that the produce was a mixture of leafy and vine produce. Thus, the interception fraction used was 0.15, an average of the values for these types. The RME exposure used a median value for the growth period of 67.5 days (CAPCOA, 1991).

Values for the fraction of produce consumed that is homegrown have been estimated for various types of vegetables and fruits (USDA, 1980 as cited in EPA, 1989a). Based on these data the reasonable maximum homegrown fractions consumed for all vegetables and fruits are 40% and 30%, respectively. Thus a high value of 40% was used in the RME exposure scenario.

AVERAGE EXPOSURE PARAMETERS FOR ALTERNATIVE EVALUATION

For the average exposure it was assumed that the produce was a mixture of leafy, vine and root produce. Thus the interception fraction that was used was 0.1, an average of the values for the three produce types. The average exposure used a plant growth period of 45 days (CAPCOA, 1991).

Values for the fraction of produce consumed that is homegrown have been estimated for various types of vegetables and fruits (USDA, 1980 as cited in EPA, 1989a). Based on these data the average homegrown fractions consumed for all vegetables and fruits are

25% and 20%, respectively. Thus a value of 25% was used in the average exposure scenario.

A.3 ALTERNATIVE RISK CHARACTERIZATION

This section presents the results of the uncertainty analysis (alternative evaluation). TABLE A-1 presents the estimated risks based on RME and average exposures for each potential carcinogen emitted by the facility as well as the total risk estimated for the facility. TABLE A-2 presents the total carcinogenic risk for chemicals for which there are only screening level URFs. TABLE A-3 presents the total non-carcinogenic risks (as Hazard Indices; HIs) based on RME and average exposures by toxicological endpoint.

Risk and HI estimates based on RME and average exposures are presented for the residential MEI only and are intended to provide a basis for comparison with the results of the CAPCOA mandated risk assessment. This information may be valuable in the risk management process.

TABLE A-1

ALTERNATIVE INCREMENTAL CANCER RISKS BY INHALATION ROUTE FOR THE RESIDENTIAL MEI

Chemical Name	RME - RISK	AVERAGE - RISK
Acrylonitrile	2.39×10^{-8}	6.87×10^{-9}
1,3-Butadiene	2.55×10^{-8}	7.33×10^{-9}
Benzene	3.61×10^{-9}	1.04×10^{-9}
Carbon Tetrachloride	2.32×10^{-7}	6.68×10^{-8}
1,4-Dioxane	6.55×10^{-8}	1.88×10^{-8}
Ethylene Oxide	8.95×10^{-8}	2.57×10^{-8}
Cadmium	3.31×10^{-7}	9.54×10^{-8}
Formaldehyde	1.66×10^{-8}	4.77×10^{-9}
Gasoline Vapors	2.67×10^{-8}	7.69×10^{-9}
Methylene Chloride	1.97×10^{-6}	5.66×10^{-7}
Nickel	7.43×10^{-8}	2.14×10^{-8}
Propylene Oxice	1.13×10^{-11}	3.24×10^{-12}
Perchloroethylene	4.46×10^{-8}	1.28×10^{-8}
Total	2.90×10^{-6}	8.34×10^{-7}

TABLE A-2

ALTERNATIVE INCREMENTAL CANCER RISKS BY INHALATION ROUTE FOR THE RESIDENTIAL MEI FOR CHEMICALS WITH SCREENING LEVEL UNIT RISK FACTORS

Chemical Name	RME - RISK	AVERAGE - RISK
Isocyanates	1.38×10^{-7}	3.98×10^{-8}

TABLE A-3

ALTERNATIVE EVALUATION
TOTAL HAZARD INDICES BY ENDPOINT
AT THE RESIDENTIAL MEI
FOR NON-CARCINOGENIC EFFECTS

Toxicological Endpoint	RME - HI	AVERAGE - HI
Cardiovascular System	0.00	0.00
Central Nervous System	0.020	0.019
Immunological System	no chemicals with immunological effects evaluated	
Kidneys	0.0015	0.00017
Gastro-intestinal System/Liver	0.018	0.018
Reproductive System	0.075	0.072
Respiratory System	0.82	0.79

RESULTS OF ALTERNATIVE EVALUATION/UNCERTAINTY ANALYSIS

The alternative evaluation was performed to provide an indication of the uncertainty associated with the CAPCOA mandated risk assessment as well as to provide more realistic estimates of carcinogenic and non-carcinogenic health risks. The alternative evaluation included the use of more realistic exposure parameter values. The values used were based on current United States Environmental Protection Agency risk assessment methodology as presented in the EPA Exposure Factors Handbook and the EPA Risk Assessment Guidance for Superfund (Part A: Human Health Evaluation Manual) (EPA, 1989; 1991). Two alternative exposure scenarios were developed: the Reasonable Maximum Exposure (RME) and the Average Exposure.

This section presented a complete discussion of and justification for the exposure parameter values used in this analysis. All other assumptions such as emission rates, estimated ambient air concentrations, and toxicity criteria (Unit Risk Factors and Acceptable Exposure Levels) were the same as mandated by CAPCOA.

Risks and Hazard Indices (HIs) are presented for the residential maximally exposed individual (MEI) only. The alternative evaluation is intended to provide a basis of comparison with the CAPCOA mandated risk assessment and may be valuable in the risk management process.

The results of the alternative evaluation or uncertainty analysis indicate:

(1) The total estimated RME cancer risk for potential carcinogens emitted from the facility (3.0×10^{-6}) is approximately 69% less than the risk estimate based on the CAPCOA mandated Lifetime Continuous Exposure (LCE).

(2) The total estimated Average Exposure cancer risk for potential carcinogens emitted from the facility (8.7 in 10^{-7}) is approximately 91% less than the risk estimate based on the CAPCOA mandated LCE.

(3) The total estimated RME HIs by endpoint are:

Toxicological Endpoint	RME - HI	Comparison to LCE HI
Cardiovascular System	0.00	= the LCE
Central Nervous System	0.020	24% < the LCE
Immunological System	No chemicals with immunological effects evaluated	
Kidneys	0.0015	62% < the LCE
Gastro-intestinal System/Liver	0.018	31% < the LCE
Reproductive System	0.075	24% < the LCE
Respiratory System	0.82	24% < the LCE

(4) The total estimated Average HIs by endpoint are:

Toxicological Endpoint	AVERAGE - HI	Comparison to LCE HI
Cardiovascular System	0.00	= the LCE
Central Nervous System	0.019	27% < the LCE
Immunological System	no chemicals with immunological effects evaluated	
Kidneys	0.00017	93% < the LCE
Gastro-intestinal System/Liver	0.018	27% < the LCE
Reproductive System	0.072	27% < the LCE
Respiratory System	0.79	27% < the LCE

Based on the SCAQMD *Supplemental Guidelines For Preparing Risk Assessments to Comply with the Air Toxics "Hot Spots" Information and Assessment Act [AB 2588]*, the RME and average cancer risk estimates at the residential MEI are less than the notification level of 1 in 100,000. In addition, with the exception of the total HI for respiratory effects, all HIs are less than the notification level of 0.5 for a Hazard Index. It should be noted that for respiratory effects, sodium hydroxide and isocyanates emissions together result in approximately 90% of the total HI.

A.5 REFERENCES

CAPCOA. 1991. *Air Toxics "Hot Spots" Program Risk Assessment Guidelines.* Prepared by the AB 2588 Risk Assessment Committee of the California Air Pollution Control Officers Association. January.

EPA. 1986. *Industrial Source Complex (ISC) Dispersion Model User's Guide - Second Edition. Volume I.* TRC Environmental Consultants, Inc. East Hartford, CT. Prepared for U.S. Environmental Protection Agency. June.

EPA. 1989a. *Exposure Factors Handbook.* Exposure Assessment Group, Office of Health and Environmental Assessment. U.S. Environmental Protection Agency. Washington D.C. EPA/600/8-89/043.

EPA. 1989b. *Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual (Part A), Interim Final.* Solid Waste and Emergency Response, U.S. Environmental Protection Agency. 9285.701A.

ICRP. 1981. Report of the Task Group on Reference Man. Prepared by Committee 2 of the International Commission on Radiological Protection. Published by Pergamon Press.

South Coast Air Quality Management District (SCAQMD). 1992. *Notice of Public Workshop: Notification Procedures for the Air Toxics "Hot Spots" Information and Assessment Act of 1987.* January 16, 1992.

FINAL

APPENDIX B

CHROMIUM(VI) PERMIT APPLICATION

by Rohr Feb 10 1992

ROHR INDUSTRIES, INC.

ROHR

8200 ARLINGTON AVENUE
RIVERSIDE, CALIFORNIA 92503-1499

(714) 351-5400 • TELEX: 69-5038

November 15, 1991

Mr. Roy Olivares
South Coast Air Quality Management District
851 S. Mt. Vernon
Colton, CA 92324

Subject: Permit Application No. 201162

Dear Roy:

It is my understanding that the permit application for our chemical processing facility was forwarded to you when the Rule 219 unit was recently dissolved. In the event you have not had an opportunity to review the file, the facility consists of three tank lines which prepare and anodize the surface of metal parts. The facility dates to the mid 1960's but was subject to permitting during the 1988 revision of Rule 219.

Rohr has an ongoing research and development program through which we are actively pursuing the elimination of manufacturing materials containing hexavalent chromium. At the time of the application, the processing facility contained several solutions with hexavalent chromium components. With the success of our program, we have now been able to eliminate these solutions. To accommodate the replacements it has been necessary to reorganize certain solutions and alter some tank parameters. When you are preparing to evaluate the application, please contact me so that I may provide a complete update.

As you might expect, the processing facility accounted for a substantial portion of the risk determined in the AB2588 study prepared for the base year of 1989. Rohr has received approval from the Toxics unit to take advantage of the chrome reductions in the update, providing the reductions are enforceable. To this end we would request that when the Permit to Operate is issued, a condition be applied which precludes the use of hexavalent chromium containing solutions.

If you have any questions, or need further information, please call me at 714/351-5840.

Sincerely,

Ron Thompson
Environmental Engineer

Ref. No. 91-215
RT/rt

SOUTH C[illegible] AIR QUALITY MANAGEM[illegible]NT DISTRICT
9150 Flair Drive El Monte, CA 91731

APPLICATION FOR PERMIT TO CONSTRUCT AND PERMIT TO OPERATE AND EXCAVATE AND FOR PLANS REQUIRED BY THE EXECUTIVE OFFICER

FOR FEE INFORMATION AND SMALL BUSINESS EXEMPTION SEE REVERSE SIDE

PLEASE TYPE OR PRINT

SCAQMD USE: SEC | TS | ID NUMBER

1A. PERMIT TO BE ISSUED TO:
Rohr Industries
BUSINESS LICENSE NAME OF ORGANIZATION THAT IS TO RECEIVE PERMIT

1B.
Rohr Industries Inc.
NAME (OR NAMES) OF OWNER OR PRINCIPAL PARTNERS DOING BUSINESS AS (DBA) ABOVE ORGANIZATION

2A. MAILING ADDRESS
8200 Arlington Ave. | Riverside | CA
NUMBER STREET | CITY OR COMMUNITY | STATE

2B.
92503-1499
ZIP CODE

3A. EQUIPMENT LOCATION (IF SAME ENTER "SAME")
SAME
NUMBER STREET | CITY OR COMMUNITY | ZIP

3B.
Van Buren
NEAREST INTERSECTING STREET

4A. CONTACT PERSON (INITIAL & NAME)
Chris W. Berglund

4B. CONTACT PHONE NO. (AREA & NO.)
(714) 351-5840

5. APPLICATION IS HEREBY MADE FOR PERMIT TO OPERATE THE FOLLOWING EQUIPMENT
Metal Surface Preparation Facility

6. IF THIS EQUIPMENT HAD A PREVIOUS WRITTEN PERMIT, STATE NAME OF CORPORATION, COMPANY, OR INDIVIDUAL OWNER THAT OPERATED THIS EQUIPMENT, AND STATE PREVIOUS AIR POLLUTION CONTROL DISTRICT PERMIT NUMBER
N/A — NAME
N/A — PREVIOUS PERMIT NUMBER

7. PERMIT APPLICATION FOR EQUIPMENT
- NEW CONSTRUCTION ☐
- ALTERATION ☐
- CHANGE OF LOCATION ☐ In accordance w/R219
- REINSTATE NON-PAYMENT P/O FEES DUE ☐
- CHANGE OF OWNERSHIP ☐
- EXISTING EQUIPMENT IN OPERATION WITHOUT PRIOR PERMIT ☒
- CHANGE OF CONDITIONS ☐

8. TYPE OF ORGANIZATION
- CORPORATION ☒
- PARTNERSHIP ☐
- INDIVIDUAL OWNER ☐
- LOCAL GOVT. AGENCY ☐
- STATE AGENCY ☐
- FEDERAL AGENCY ☐
- UTILITY ☐

9. ESTIMATED COST OF EQUIPMENT OR ALTERATION
BASIC EQUIPMENT $ $7 Million
AIR POLLUTION CONTROL EQUIPMENT $ N/A

10. FOR THE NEW CONSTRUCTION, ALTERATION, TRANSFER OF OWNERSHIP OR LOCATION, WHAT IS
ESTIMATED STARTING DATE? N/A
ESTIMATED COMPLETION DATE? N/A

11. GENERAL NATURE OF BUSINESS
Aerospace Parts Manufacturing

12. PRINCIPAL PRODUCT
Aerospace

13. DO YOU CLAIM CONFIDENTIALITY OF DATA?
YES ☒ NO ☐
IF YES STATE NATURE OF DATA ON SEPARATE SHEET

14. NORMAL OPERATING HOURS OF SUBJECT EQUIPMENT
HOURS/DAY 24
DAYS/WEEK 6
WEEKS/YEAR 52

15. HAS A CEQA DOCUMENT BEEN PREPARED FOR THIS PROJECT? YES ☐ NO ☒

15A. ARE ALL COMPANIES' FACILITIES IN CALIFORNIA IN COMPLIANCE WITH AIR POLLUTION RULES?
YES ☒ NO ☐

16. SIGNATURE OF RESPONSIBLE MEMBER OF ORGANIZATION

17. OFFICIAL TITLE OF SIGNER
Environmental Engineer

18. TYPED OR PRINTED NAME OF SIGNER
Chris W. Berglund

19. PHONE NO.
714/351-5840

20. DATE
5-25-89

SCAQMD USE

SIC NO.		EQUIP CAT NO. ___ ___ ___ ___ ___ /___ ___	SCH/STP
APPLICATION NO.	PERMIT NO.	TYPE B OR C	WORK UNITS A/C P/O
ASSIGNMENT UNIT ENGR	CLASS I III IV		
VALIDATION	FILING FEE $	CHECK OR MONEY ORDER NUMBER	

400A PRIOR VERSIONS NOT VALID

(Continued on Reverse)

SEE REVERSE FOR FEES REQUIRED UPON FILING

South Coast
AIR QUALITY MANAGEMENT DISTRICT

RECEIPT NO. E 1785

June 2 19 89

RECEIVED FROM Pyhs Industries $ 75—

Seventy five and xx/100 DOLLARS

FOR (1) Application

CASH

CHECK NO. 3849

8300 Arlington Ave
Riverside

Mary Nosek
Customer Serv
OFFICIAL TITLE

APP# 201162

ROHR INDUSTRIES, INC.
CASHIERS IMPREST FUND (R)
8200 ARLINGTON AVENUE
RIVERSIDE, CA 92503-1499

3849

16-24/500
1220(7)

May 23, 1989

PAY TO THE ORDER OF South Coast Air Quality Management District $ **75.00**

****Seventy-five and 00/100**** DOLLARS

LOS ANGELES MAIN OFFICE
WELLS FARGO BANK
333 SOUTH GRAND AVENUE, LOS ANGELES, CA 90071

FOR Chemical Processing Facility

Janet L. Cross

⑈003849⑈ ⑆122000247⑆4600 07582 7⑈

89399-02

Toxic Hot spot removal of E.D.C.
From Ralph Weiler
10/24/91

CYANAMID

American Cyanamid Company
Engineered Materials Department
15 South Grady Way
Renton, WA 98055
(206) 228-6262

bcc: D. Baker
M. Kokosinski
D. Megna

October 26, 1990

Rohr Industries, Inc.
8200 Arlington Avenue
Riverside, CA 92503-1499

Attention: Procurement Manager

The Maryland Department of the Environment has enacted limits for the air emissions of certain chemicals. Ethylene Dichloride (EDC) is one chemical being regulated. EDC is contained in those American Cyanamid products listed on the attached sheet. In order to meet these regulations, EDC can no longer be used in the manufacture of our products.

In response to this regulatory change, American Cyanamid Company's Adhesive Technical Group has engaged in an extensive effort to find suitable replacement solvents for EDC. As a result, the EDC containing solvent blend has been replaced in all of the products listed in the attachment with a solvent blend less potentially dangerous to worker health and safety.

Specifically, your company purchases the EDC-containing material listed below. Listed next to the product purchased is a description of the new solvent blend that does not contain EDC. Please note that the solvent blend is the only change made in this product.

PRODUCT	EDC CONTAINING SOLVENT BLEND	NON-EDC SOLVENT BLEND
BR 227 Pour Coat, 30%	Methyl Ethyl Ketone Ethylene Dichloride	Methyl Ethyl Ketone Tetrahydro Furan
BR 227A	Methyl Ethyl Ketone Ethylene Dichloride Dioxane	Toluene, Ethanol 1,3 - Dioxolane Methyl Ethyl Ketone
FM 641 Verifilm	Methylene Chloride Ethylene Dichloride	1,3 - Dioxane Ethanol 1-Mathyl-2-Propanol

In compliance with the Maryland Department of Environment, American Cyanamid Company will cease manufacture of all EDC containing products as of 1 July 1990. Replacement products without EDC will be manufactured to fill new and existing customer orders after 1 July 1990. However, existing inventory can be sold on a first come, first serve basis. There will be no change in product designation or existing pricing as a result of this solvent change.

American Cyanamid Company wishes to thank you for your continued business and appreciates the opportunity to be of service.

Sincerely,

AMERICAN CYANAMID COMPANY

Diana T. Megna
Technical Service Supervisor
Aerospace Adhesives

Attachment

1-301-939-1910 - 282

Tony - 352

APPENDIX C

SPREADSHEETS

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Hazard Indices - ACUTE

EQUATION

HI = AAC/AEL

SYMBOLS AND DESCRIPTIONS	UNITS	VALUE
AAC = Ambient Air Concentration	µg/m^3	see below
AEL = Allowable Exposure Level	µg/m^3	see below
HI = Hazard Index	unitless	see below

ACUTE

Noncarcinogens	AAC	AEL	HI
Carbon Tetrachloride	6.84E-01	1.90E+02	3.60E-03
Chlorine	2.60E+00	2.30E+01	1.13E-01
Formaldehyde	4.10E-02	3.70E+02	1.11E-04
Methylene Chloride	1.70E+02	3.50E+03	4.87E-02
Perchloroethylene	5.34E+00	6.80E+03	7.86E-04
Hydrogen Fluoride	2.90E-01	5.80E+02	4.99E-04
Lead	6.00E-05	1.50E+00	4.00E-05
TOTAL			1.67E-01

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Hazard Indices - CHRONIC

EQUATION

RfD = AEL * mg/1000 * 20 m^3/day * 1/70 kg
ADD = AAC * IR * BW * EF * ED * EY * 1/AT * CF1 * 1/CF2
HI = ADD/RfD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	µg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
EF = Exposure Frequency	days/year	365	365	350
ED = Exposure Duration	hours/week	168	128	128
EY = Exposure Duration	years	70	30	9
AT = Averaging Time	days	25550	10950	3285
CF1 = Convertion Factor	mg/µg	0.001	0.001	0.001
CF2 = Convertion Factor	days/week	7	7	7
ADD = Average Daily Dose	mg/kg-day	see below	see below	see below
RfD = Reference Dose	mg/kg-day	see below	see below	see below

CHRONIC			LCE		RME		AVG	
Noncarcinogens	RfD	AAC	ADD	HI	ADD	HI	ADD	HI
Chlorine	2.03E-03	1.31E-01	3.73E-05	**1.84E-02**	2.84E-05	**1.40E-02**	2.72E-05	**1.34E-02**
Chlorofluorocarbons	2.00E-01	1.05E+01	3.00E-03	**1.50E-02**	2.28E-03	**1.14E-02**	2.19E-03	**1.09E-02**
Glycol Ether	2.86E-03	9.91E-01	2.82E-04	**9.86E-02**	2.15E-04	**7.51E-02**	2.06E-04	**7.20E-02**
Xylenes	8.57E-02	2.50E+00	7.10E-04	**8.29E-03**	5.41E-04	**6.32E-03**	5.19E-04	**6.06E-03**
Toluene	5.71E-01	2.99E+00	8.50E-04	**1.49E-03**	6.48E-04	**1.13E-03**	6.21E-04	**1.09E-03**
Isocyanates	2.71E-05	4.56E-02	1.30E-05	**4.79E-01**	9.88E-06	**3.65E-01**	9.47E-06	**3.50E-01**
Methyl Chloroform	9.14E-02	2.27E+00	6.45E-04	**7.06E-03**	4.91E-04	**5.38E-03**	4.71E-04	**5.16E-03**
Perchloroethylene	1.00E-02	2.53E-01	7.21E-05	**7.21E-03**	5.49E-05	**5.49E-03**	5.27E-05	**5.27E-03**
Phenol	1.29E-02	1.40E-02	3.97E-06	**3.08E-04**	3.02E-06	**2.34E-04**	2.90E-06	**2.25E-04**
Manganese	2.86E-04	1.22E-03	3.47E-07	**1.21E-03**	2.65E-07	**9.25E-04**	2.54E-07	**8.87E-04**
Methanol	1.77E-01	7.73E-02	2.20E-05	**1.24E-04**	1.68E-05	**9.47E-05**	1.61E-05	**9.08E-05**
Sodium Hydroxide	1.37E-03	2.27E+00	6.46E-04	**4.71E-01**	4.92E-04	**3.59E-01**	4.72E-04	**3.44E-01**
Cadmium	1.00E-03	2.60E-04	7.40E-08	**7.40E-05**	5.64E-08	**5.64E-05**	5.41E-08	**5.41E-05**
Benzene	2.03E-02	4.10E-03	1.17E-06	**5.75E-05**	8.89E-07	**4.38E-05**	8.52E-07	**4.20E-05**
Hydrogen Fluoride	1.69E-03	8.16E-03	2.32E-06	**1.37E-03**	1.77E-06	**1.05E-03**	1.70E-06	**1.00E-03**
Carbon Tetrachloride	6.86E-04	1.82E-02	5.18E-06	**7.55E-03**	3.95E-06	**5.76E-03**	3.79E-06	**5.52E-03**
Methylene chloride	8.57E-01	6.48E+00	1.84E-03	**2.15E-03**	1.40E-03	**1.64E-03**	1.35E-03	**1.57E-03**
Formaldehyde	1.03E-03	4.20E-03	1.20E-06	**1.16E-03**	9.11E-07	**8.84E-04**	8.73E-07	**8.48E-04**
Ethylene Dichloride	2.70E-02	2.24E-01	6.38E-05	**2.36E-03**	4.86E-05	**1.80E-03**	4.66E-05	**1.73E-03**

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Chronic Hazard Indices by Toxicological Endpoint

LCE

CHEMICAL	CV	CNS	IMMUN	KIDN	GI/LIVER	REPRO	RESP
Chlorine							0.0184
Chlorofluorocarbons		0.015					
Glycol Ether						0.0986	0.0986
Xylenes							0.00829
Toluene		0.00149					
Isocyanates							0.479
Methyl Chloroform		0.00706			0.00706		
Perchloroethylene					0.00721		
Phenol							0.000308
Manganese		0.00121					0.00121
Methanol		0.000124					
Sodium Hydroxide							0.471
Cadmium **				0.0015346			0.00146
Benzene		5.75E-05					
Hydrogen Fluoride							0.00137
Carbon Tetrachloride					0.00755		
Methylene chloride		0.00215			0.00215		
Formaldehyde							0.00116
Ethylene Dichloride			0.002364	0.0023639	0.002364		
TOTAL	0	0.027092	0.002364	0.0038985	0.026334	0.0986	1.080798

**includes both inhalation and multipathway

RME

CHEMICAL	CV	CNS	IMMUN	KIDN	GI/LIVER	REPRO	RESP
Chlorine							0.014
Chlorofluorocarbons		0.0114					
Glycol Ether						0.0751	0.0751
Xylenes							0.00632
Toluene		0.00113					
Isocyanates							0.365
Methyl Chloroform		0.00538			0.00538		
Perchloroethylene					0.00549		
Phenol							0.000234
Manganese		0.000925					0.000925
Methanol		9.47E-05					
Sodium Hydroxide							0.359
Cadmium **				0.000257			0.000201
Benzene		4.38E-05					
Hydrogen Fluoride							0.00105
Carbon Tetrachloride					0.00576		
Methylene chloride		0.00164			0.00164		
Formaldehyde							0.000884
Ethylene Dichloride			0.001801	0.0018011	0.001801		
TOTAL	0	0.020614	0.001801	0.0020581	0.020071	0.0751	0.822714

** includes inhalation and multipathway

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Chronic Hazard Indices by Toxicological Endpoint

AVERAGE

CHEMICAL	CV	CNS	IMMUN	KIDN	GI/LIVER	REPRO	RESP
Chlorine							0.0134
Chlorofluorocarbons		0.0109					
Glycol Ether						0.072	0.072
Xylenes							0.00606
Toluene		0.00109					
Isocyanates							0.35
Methyl Chloroform		0.00516			0.00516		
Perchloroethylene					0.00527		
Phenol							0.000225
Manganese		0.000887					0.000887
Methanol		9.08E-05					
Sodium Hydroxide							0.344
Cadmium **				0.000107			5.31E-05
Benzene		0.000042					
Hydrogen Fluoride							0.001
Carbon Tetrachloride					0.00552		
Methlene chloride		0.00157			0.00157		
Formaldehyde							0.000848
Ethylene Dichloride			0.001727	0.0017271	0.001727		
TOTAL	0	0.01974	0.001727	0.0018341	0.019247	0.072	0.788473

** includes inhalation and multipathway

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - OCCUPATIONAL
Calculation Endpoint: Hazard Indices - ACUTE

EQUATION

HI = AAC/AEL

SYMBOLS AND DESCRIPTIONS	UNITS	VALUE
AAC = Ambient Air Concentration	µg/m^3	see below
AEL = Allowable Exposure Level	µg/m^3	see below
HI = Hazard Index	unitless	see below

ACUTE

Noncarcinogens	AAC	AEL	HI
Carbon Tetrachloride	1.86E+00	1.90E+02	9.79E-03
Chlorine	6.37E-01	2.30E+01	2.77E-02
Formaldehyde	2.81E-02	3.70E+02	7.60E-05
Methylene Chloride	1.55E+02	3.50E+03	4.43E-02
Perchloroethylene	4.87E+00	6.80E+03	7.16E-04
Hydrogen Fluoride	3.25E-01	5.80E+02	5.60E-04
Lead	1.00E-04	1.50E+00	6.67E-05
TOTAL			8.32E-02

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - OCCUPATIONAL
Calculation Endpoint: Hazard Indices - CHRONIC

EQUATION

RfD = AEL * mg/1000 * 20 m^3/day * 1/70 kg
ADD = AAC * IR * BW * EF * ED * EY * 1/AT * CF1 * 1/CF2
HI = ADD/RfD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	µg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
EF = Exposure Frequency	weeks/year	50	50	50
ED = Exposure Duration	hours/week	40	40	40
EY = Exposure Duration	years	46	30	9
AT = Averaging Time	days	16790	10950	3285
CF1 = Convertion Factor	mg/µg	0.001	0.001	0.001
ADD = Average Daily Dose	mg/kg-day	see below	see below	see below
RfD = Reference Dose	mg/kg-day	see below	see below	see below

CHRONIC			LCE		RME		AVG	
Noncarcinogens	RfD	AAC	ADD	HI	ADD	HI	ADD	HI
Chlorine	2.03E-03	1.26E-02	8.16E-07	**4.02E-04**	8.16E-07	**4.02E-04**	8.16E-07	**4.02E-04**
Chlorofluorocarbons	2.00E-01	5.59E+00	3.63E-04	**1.82E-03**	3.63E-04	**1.82E-03**	3.63E-04	**1.82E-03**
Glycol Ether	2.86E-03	4.45E-01	2.89E-05	**1.01E-02**	2.89E-05	**1.01E-02**	2.89E-05	**1.01E-02**
Xylenes	8.57E-02	1.05E+00	6.79E-05	**7.92E-04**	6.79E-05	**7.92E-04**	6.79E-05	**7.92E-04**
Toluene	5.71E-01	1.57E+00	1.02E-04	**1.78E-04**	1.02E-04	**1.78E-04**	1.02E-04	**1.78E-04**
Isocyanates	2.71E-05	2.69E-02	1.75E-06	**6.44E-02**	1.75E-06	**6.44E-02**	1.75E-06	**6.44E-02**
Methyl Chloroform	9.14E-02	2.24E+00	1.46E-04	**1.59E-03**	1.46E-04	**1.59E-03**	1.46E-04	**1.59E-03**
Perchloroethylene	1.00E-02	1.02E-01	6.63E-06	**6.63E-04**	6.63E-06	**6.63E-04**	6.63E-06	**6.63E-04**
Phenol	1.29E-02	3.19E-02	2.07E-06	**1.61E-04**	2.07E-06	**1.61E-04**	2.07E-06	**1.61E-04**
Manganese	2.86E-04	2.90E-04	1.88E-08	**6.59E-05**	1.88E-08	**6.59E-05**	1.88E-08	**6.59E-05**
Methanol	1.77E-01	9.71E-02	6.31E-06	**3.56E-05**	6.31E-06	**3.56E-05**	6.31E-06	**3.56E-05**
Sodium Hydroxide	1.37E-03	4.07E-01	2.64E-05	**1.93E-02**	2.64E-05	**1.93E-02**	2.64E-05	**1.93E-02**
Cadmium	1.00E-03	1.00E-04	6.50E-09	**6.50E-06**	6.50E-09	**6.50E-06**	6.50E-09	**6.50E-06**
Benzene	2.03E-02	1.31E-03	8.51E-08	**4.19E-06**	8.51E-08	**4.19E-06**	8.51E-08	**4.19E-06**
Hydrogen Fluoride	1.69E-03	6.18E-03	4.02E-07	**2.38E-04**	4.02E-07	**2.38E-04**	4.02E-07	**2.38E-04**
Carbon Tetrachloride	6.86E-04	3.23E-02	2.10E-06	**3.06E-03**	2.10E-06	**3.06E-03**	2.10E-06	**3.06E-03**
Methlene chloride	8.57E-01	2.98E+00	1.94E-04	**2.26E-04**	1.94E-04	**2.26E-04**	1.94E-04	**2.26E-04**
Formaldehyde	1.03E-03	1.48E-03	9.62E-08	**9.34E-05**	9.62E-08	**9.34E-05**	9.62E-08	**9.34E-05**
Ethylene Dichloride	2.71E-02	9.15E-02	5.94E-06	**2.19E-04**	5.94E-06	**2.19E-04**	5.94E-06	**2.19E-04**

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - OCCUPATIONAL
Calculation Endpoint: Chronic Hazard Indices by Toxicological Endpoint

LCE/RME/AVERAGE

CHEMICAL	CV	CNS	IMMUN	KIDN	GI/LIVER	REPRO	RESP
Chlorine							0.000402
Chlorofluorocarbons		0.001816					
Glycol Ether						0.0101057	0.010106
Xylenes							0.000792
Toluene		0.000178					
Isocyanates							0.064419
Methyl Chloroform		0.001592			0.001592		
Perchloroethylene					0.000663		
Phenol							0.000161
Manganese		6.59E-05					6.59E-05
Methanol		3.56E-05					
Sodium Hydroxide							0.019306
Cadmium				6.497E-06			6.5E-06
Benzene		4.19E-06					
Hydrogen Fluoride							0.000238
Carbon Tetrachloride					0.00306		
Methylene chloride		0.000226			0.000226		
Formaldehyde							9.34E-05
Ethylene Dichloride			0.000219	0.0002193	0.000219		
TOTAL	0	0.003918	0.000219	0.0002258	0.005761	0.0101057	0.095589

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Incremental Cancer Risk

EQUATION

CPS = URF * 1000 μg/mg * day/20 m^3 * 70 kg
LADD = AAC * IR * BW * EF * ED * EY * 1/EL * CF1 * 1/CF2
RISK = CPS * LADD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	μg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
EF = Exposure Frequency	days/year	365	365	350
ED = Exposure Duration	hours/week	168	128	128
EY = Exposure Duration	years	70	30	9
EL = Exposure Duration	days	25550	27375	27375
CF1 = Convertion Factor	mg/μg	0.001	0.001	0.001
CF2 = Convertion Factor	days/week	7	7	7
LADD = Lifetime Average Daily Dose	mg/kg-day	see below	see below	see below
CPS = Cancer Potency Slope	(mg/kg-day)^-1	see below	see below	see below

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	2.70E-04	7.68E-08	**7.84E-08**	2.34E-08	**2.39E-08**	6.74E-09	6.87E-09
1,3 Butadiene	9.80E-01	3.00E-04	8.54E-08	**8.37E-08**	2.60E-08	**2.55E-08**	7.48E-09	7.33E-09
Benzene	1.02E-01	4.10E-04	1.17E-07	**1.18E-08**	3.56E-08	**3.61E-09**	1.02E-08	1.04E-09
Carbon Tetrachloride	1.47E-01	1.82E-02	5.18E-06	**7.62E-07**	1.58E-06	**2.32E-07**	4.54E-07	6.68E-08
1,4-Dioxane	2.70E-02	2.80E-02	7.96E-06	**2.15E-07**	2.43E-06	**6.55E-08**	6.98E-07	1.88E-08
Ethylene Oxide	3.08E-01	3.35E-03	9.53E-07	**2.94E-07**	2.91E-07	**8.95E-08**	8.36E-08	2.57E-08
Cadmium	1.47E+01	2.60E-04	7.40E-08	**1.09E-06**	2.25E-08	**3.31E-07**	6.49E-09	9.54E-08
Formaldehyde	4.55E-02	4.20E-03	1.20E-06	**5.44E-08**	3.64E-07	**1.66E-08**	1.05E-07	4.77E-09
Gasoline Vapors	2.97E-03	1.04E-01	2.95E-05	**8.78E-08**	9.01E-06	**2.67E-08**	2.59E-06	7.69E-09
Methylene Chloride	3.50E-03	6.48E+00	1.84E-03	**6.45E-06**	5.62E-04	**1.97E-06**	1.62E-04	5.66E-07
Nickel	8.40E-01	1.02E-03	2.90E-07	**2.44E-07**	8.85E-08	**7.43E-08**	2.54E-08	2.14E-08
Propylene Oxide	1.30E-02	1.00E-05	2.85E-09	**3.70E-11**	8.67E-10	**1.13E-11**	2.49E-10	3.24E-12
Perchloroethylene	2.03E-03	2.53E-01	7.21E-05	**1.46E-07**	2.20E-05	**4.46E-08**	6.32E-06	1.28E-08
TOTAL				**9.52E-06**		**2.90E-06**		8.34E-07

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - RESIDENTIAL
Calculation Endpoint: Incremental Cancer Risk
CHEMICALS WITH SCREENING UNIT RISK FACTORS

EQUATION

CPS = URF * 1000 μg/mg * day/20 m^3 * 70 kg
LADD = AAC * IR * BW * EF * ED * EY * 1/EL * CF1 * 1/CF2
RISK = CPS * LADD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	μg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
EF = Exposure Frequency	days/year	365	365	350
ED = Exposure Duration	hours/week	168	128	128
EY = Exposure Duration	years	70	30	9
EL = Exposure Duration	days	25550	27375	27375
CF1 = Convertion Factor	mg/μg	0.001	0.001	0.001
CF2 = Convertion Factor	days/week	7	7	7
LADD = Lifetime Average Daily Dose	mg/kg-day	see below	see below	see below
CPS = Cancer Potency Slope	(mg/kg-day)^-1	see below	see below	see below

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	4.56E-02	1.30E-05	**4.54E-07**	3.95E-06	**1.38E-07**	1.14E-06	**3.98E-08**
TOTAL				**4.54E-07**		**1.38E-07**		**3.98E-08**

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - OCCUPATIONAL
Calculation Endpoint: Incremental Cancer Risk

EQUATION

CPS = URF * 1000 μg/mg * day/20 m^3 * 70 kg
LADD = AAC * IR * BW * EW * ED * EY * 1/EL * CF1
RISK = CPS * LADD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	μg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
ED = Exposure Duration	hours/week	40	40	40
EW = Exposure Duration	weeks/year	50	50	50
EY = Exposure Duration	years	46	30	9
EL = Exposure Duration	days	25550	27375	27375
CF1 = Convertion Factor	mg/μg	0.001	0.001	0.001
LADD = Lifetime Average Daily Dose	mg/kg-day	see below	see below	see below
CPS = Cancer Potency Slope	(mg/kg-day)^-1	see below	see below	see below

			LCE		RME		AVG	
Carcinogens	**CPS**	**AAC**	**LADD**	**RISK**	**LADD**	**RISK**	**LADD**	**RISK**
Acrylonitrile	1.02E+00	1.90E-04	8.11E-09	**8.27E-09**	4.94E-09	**5.04E-09**	1.48E-09	**1.51E-09**
1,3 Butadiene	9.80E-01	2.30E-04	9.82E-09	**9.62E-09**	5.98E-09	**5.86E-09**	1.79E-09	**1.76E-09**
Benzene	1.02E-01	1.31E-03	5.59E-08	**5.68E-09**	3.40E-08	**3.46E-09**	1.02E-08	**1.04E-09**
Carbon Tetrachloride	1.47E-01	3.23E-02	1.38E-06	**2.03E-07**	8.40E-07	**1.23E-07**	2.52E-07	**3.70E-08**
1,4-Dioxane	2.70E-02	2.16E-02	9.23E-07	**2.49E-08**	5.62E-07	**1.52E-08**	1.69E-07	**4.55E-09**
Ethylene Oxide	3.08E-01	8.14E-03	2.62E-07	**8.07E-08**	1.60E-07	**4.91E-08**	4.79E-08	**1.47E-08**
Cadmium	1.47E+01	1.00E-04	4.27E-09	**6.28E-08**	2.60E-09	**3.82E-08**	7.80E-10	**1.15E-08**
Formaldehyde	4.55E-02	1.48E-03	6.32E-08	**2.88E-09**	3.85E-08	**1.75E-09**	1.15E-08	**5.25E-10**
Gasoline Vapors	2.97E-03	1.01E-01	4.31E-06	**1.28E-08**	2.63E-06	**7.80E-09**	7.88E-07	**2.34E-09**
Methylene Chloride	3.50E-03	2.98E+00	1.27E-04	**4.46E-07**	7.75E-05	**2.71E-07**	2.33E-05	**8.14E-08**
Nickel	8.40E-01	3.90E-04	1.67E-08	**1.40E-08**	1.01E-08	**8.51E-09**	3.04E-09	**2.55E-09**
Propylene Oxide	1.30E-02	1.00E-05	4.27E-10	**5.55E-12**	2.60E-10	**3.38E-12**	7.80E-11	**1.01E-12**
Perchloroethylene	2.03E-03	1.02E-01	4.36E-06	**8.85E-09**	2.65E-06	**5.39E-09**	7.96E-07	**1.62E-09**
TOTAL				**8.79E-07**		**5.35E-07**		**1.61E-07**

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: MEI Inhalation of Indicator Chemicals - OCCUPATIONAL
Calculation Endpoint: Incremental Cancer Risk
CHEMICALS WITH SCREENING UNIT RISK FACTORS

EQUATION

CPS = URF * 1000 μg/mg * day/20 m^3 * 70 kg
LADD = AAC * IR * BW * EW * ED * EY * 1/EL * CF1
RISK = CPS * LADD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	μg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	70	70
ED = Exposure Duration	hours/week	40	40	40
EW = Exposure Duration	weeks/year	50	50	50
EY = Exposure Duration	years	46	30	9
EL = Exposure Duration	days	25550	27375	27375
CF1 = Convertion Factor	mg/μg	0.001	0.001	0.001
LADD = Lifetime Average Daily Dose	mg/kg-day	see below	see below	see below
CPS = Cancer Potency Slope	(mg/kg-day)^-1	see below	see below	see below

			LCE		RME		AVG	
Carcinogens	**CPS**	**AAC**	**LADD**	**RISK**	**LADD**	**RISK**	**LADD**	**RISK**
Isocyanates	3.50E-02	2.69E-02	1.15E-06	**4.02E-08**	6.98E-07	**2.44E-08**	2.09E-07	**7.33E-09**
TOTAL				**4.02E-08**		**2.44E-08**		**7.33E-09**

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: Inhalation of Indicator Chemicals for Sensitive Receptors
Calculation Endpoint: Incremental Cancer Risk

EQUATION

CPS = URF * 1000 μg/mg * day/20 m^3 * 70 kg
LADD = AAC * IR * BW * EF * ED * EY * 1/EL * CF1 * 1/CF2
RISK = CPS * LADD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
AAC = Ambient Air Concentration	μg/m^3	see below	see below	see below
IR = Inhalation rate	m^3/hour	0.83	0.83	0.83
BW = Body Weight	kg	70	36	36
EF = Exposure Frequency	days/year	365	200	200
ED = Exposure Duration	hours/week	168	50	50
EY = Exposure Duration	years	70	18	9
EL = Exposure Duration	days	25550	27375	27375
CF1 = Convertion Factor	mg/μg	0.001	0.001	0.001
CF2 = Convertion Factor	days/week	7	7	7
LADD = Lifetime Average Daily Dose	mg/kg-day	see below	see below	see below
CPS = Cancer Potency Slope	(mg/kg-day)^-1	see below	see below	see below

PARADISE DAY SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	1.90E-04	5.41E-08	**5.51E-08**	4.11E-09	**4.20E-09**	2.06E-09	**2.10E-09**
1,3 Butadiene	9.80E-01	2.30E-04	6.55E-08	**5.41E-08**	4.98E-09	**4.88E-09**	2.49E-09	**2.44E-09**
Benzene	1.02E-01	5.00E-04	1.42E-07	**1.44E-08**	1.08E-08	**1.10E-09**	5.41E-09	**5.50E-10**
Carbon Tetrachloride	1.47E-01	7.61E-03	2.17E-06	**3.18E-07**	1.65E-07	**2.42E-08**	8.24E-08	**1.21E-08**
1,4-Dioxane	2.70E-02	8.54E-03	2.43E-06	**6.56E-08**	1.85E-07	**4.99E-09**	9.25E-08	**2.50E-09**
Ethylene Dichloride	7.70E-02	2.61E-02	7.42E-06	**5.72E-07**	5.65E-07	**4.35E-08**	2.83E-07	**2.18E-08**
Ethylene Oxide	3.08E-01	1.33E-03	3.78E-07	**1.17E-07**	2.88E-08	**8.87E-09**	1.44E-08	**4.44E-09**
Cadmium	1.47E+01	2.00E-05	5.69E-09	**8.37E-08**	4.33E-10	**6.37E-09**	2.17E-10	**3.18E-09**
Formaldehyde	4.55E-02	6.20E-04	1.76E-07	**8.03E-09**	1.34E-08	**6.11E-10**	6.71E-09	**3.05E-10**
Gasoline Vapor	2.97E-03	1.04E-01	2.97E-05	**8.83E-08**	2.26E-06	**6.72E-09**	1.13E-06	**3.36E-09**
Methylene Chloride	3.50E-03	5.70E-01	1.62E-04	**5.68E-07**	1.24E-05	**4.32E-08**	6.18E-06	**2.16E-08**
Nickel	8.40E-01	7.00E-05	1.99E-08	**1.67E-08**	1.52E-09	**1.27E-09**	7.58E-10	**6.37E-10**
Propylene Oxide	1.30E-02	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
Perchloroethylene	2.03E-03	2.78E-02	7.90E-06	**1.60E-08**	6.01E-07	**1.22E-09**	3.01E-07	**6.10E-10**
TOTAL				1.99E-06		1.51E-07		7.56E-08

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: Inhalation of Indicator Chemicals for Sensitive Receptors
Calculation Endpoint: Incremental Cancer Risk

ARLANZA SCHOOL			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	7.00E-05	1.99E-08	**2.03E-08**	1.52E-09	**1.55E-09**	7.58E-10	**7.73E-10**
1,3 Butadiene	9.80E-01	1.10E-04	3.13E-08	**3.07E-08**	2.38E-09	**2.33E-09**	1.19E-09	**1.17E-09**
Benzene	1.02E-01	9.80E-04	2.79E-07	**2.83E-08**	2.12E-08	**2.15E-09**	1.06E-08	**1.08E-09**
Carbon Tetrachloride	1.47E-01	1.10E-02	3.13E-06	**4.60E-07**	2.38E-07	**3.50E-08**	1.19E-07	**1.75E-08**
1,4-Dioxane	2.70E-02	9.82E-03	2.79E-06	**7.55E-08**	2.13E-07	**5.74E-09**	1.06E-07	**2.87E-09**
Ethylene Dichloride	7.70E-02	4.69E-02	1.33E-05	**1.03E-06**	1.01E-06	**7.81E-08**	5.07E-07	**3.91E-08**
Ethylene Oxide	3.08E-01	1.90E-03	5.41E-07	**1.67E-07**	4.11E-08	**1.27E-08**	2.06E-08	**6.34E-09**
Cadmium	1.47E+01	1.00E-05	2.85E-09	**4.18E-08**	2.17E-10	**3.18E-09**	1.08E-10	**1.59E-09**
Formaldehyde	4.55E-02	1.06E-03	3.02E-07	**1.37E-08**	2.30E-08	**1.04E-09**	1.15E-08	**5.22E-10**
Gasoline Vapors	2.97E-03	2.44E-02	6.95E-06	**2.06E-08**	5.29E-07	**1.57E-09**	2.64E-07	**7.85E-10**
Methylene Chloride	3.50E-03	5.73E-01	1.63E-04	**5.71E-07**	1.24E-05	**4.34E-08**	6.20E-06	**2.17E-08**
Nickel	8.40E-01	6.00E-05	1.71E-08	**1.43E-08**	1.30E-09	**1.09E-09**	6.50E-10	**5.46E-10**
Propylene Oxide	1.30E-02	1.00E-05	2.85E-09	**3.70E-11**	2.17E-10	**2.82E-12**	1.08E-10	**1.41E-12**
Perchloroethylene	2.03E-03	2.39E-02	6.80E-06	**1.38E-08**	5.17E-07	**1.05E-09**	2.59E-07	**5.25E-10**
TOTAL				2.48E-06		1.89E-07		9.45E-08

CREST HAVEN SCHOOL			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	5.00E-05	1.42E-08	**1.45E-08**	1.08E-09	**1.10E-09**	5.41E-10	**5.52E-10**
1,3 Butadiene	9.80E-01	9.00E-05	2.56E-08	**2.51E-08**	1.95E-09	**1.91E-09**	9.75E-10	**9.55E-10**
Benzene	1.02E-01	5.50E-04	1.57E-07	**1.59E-08**	1.19E-08	**1.21E-09**	5.96E-09	**6.04E-10**
Carbon Tetrachloride	1.47E-01	3.77E-03	1.07E-06	**1.58E-07**	8.16E-08	**1.20E-08**	4.08E-08	**6.00E-09**
1,4-Dioxane	2.70E-02	5.67E-03	1.61E-06	**4.36E-08**	1.23E-07	**3.32E-09**	6.14E-08	**1.66E-09**
Ethylene Dichloride	7.70E-02	2.89E-02	8.21E-06	**6.32E-07**	6.25E-07	**4.81E-08**	3.12E-07	**2.41E-08**
Ethylene Oxide	3.08E-01	6.40E-04	1.82E-07	**5.61E-08**	1.39E-08	**4.27E-09**	6.93E-09	**2.13E-09**
Cadmium	1.47E+01	1.00E-05	2.85E-09	**4.18E-08**	2.17E-10	**3.18E-09**	1.08E-10	**1.59E-09**
Formaldehyde	4.55E-02	5.90E-04	1.68E-07	**7.64E-09**	1.28E-08	**5.81E-10**	6.39E-09	**2.91E-10**
Gasoline Vapors	2.97E-03	1.50E-02	4.28E-06	**1.27E-08**	3.26E-07	**9.67E-10**	1.63E-07	**4.84E-10**
Methylene Chloride	3.50E-03	3.26E-01	9.29E-05	**3.25E-07**	7.07E-06	**2.47E-08**	3.53E-06	**1.24E-08**
Nickel	8.40E-01	3.00E-05	8.54E-09	**7.17E-09**	6.50E-10	**5.46E-10**	3.25E-10	**2.73E-10**
Propylene Oxide	1.30E-02	2.00E-05	5.69E-09	**7.40E-11**	4.33E-10	**5.63E-12**	2.17E-10	**2.82E-12**
Perchloroethylene	2.03E-03	1.39E-02	3.95E-06	**8.02E-09**	3.01E-07	**6.11E-10**	1.50E-07	**3.05E-10**
TOTAL				1.35E-06		1.03E-07		5.13E-08

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: Inhalation of Indicator Chemicals for Sensitive Receptors
Calculation Endpoint: Incremental Cancer Risk

FOOTHILL SCHOOL			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	8.00E-05	2.28E-08	**2.32E-08**	1.73E-09	**1.77E-09**	8.66E-10	**8.84E-10**
1,3 Butadiene	9.80E-01	9.00E-05	2.56E-08	**2.51E-08**	1.95E-09	**1.91E-09**	9.75E-10	**9.55E-10**
Benzene	1.02E-01	6.70E-04	1.91E-07	**1.94E-08**	1.45E-08	**1.47E-09**	7.26E-09	**7.36E-10**
Carbon Tetrachloride	1.47E-01	3.15E-03	8.96E-07	**1.32E-07**	6.82E-08	**1.00E-08**	3.41E-08	**5.01E-09**
1,4-Dioxane	2.70E-02	7.51E-03	2.14E-06	**5.77E-08**	1.63E-07	**4.39E-09**	8.13E-08	**2.20E-09**
Ethylene Dichloride	7.70E-02	3.50E-02	9.96E-06	**7.67E-07**	7.58E-07	**5.84E-08**	3.79E-07	**2.92E-08**
Ethylene Oxide	3.08E-01	5.50E-04	1.57E-07	**4.82E-08**	1.19E-08	**3.67E-09**	5.96E-09	**1.83E-09**
Cadmium	1.47E+01	1.00E-05	2.85E-09	**4.18E-08**	2.17E-10	**3.18E-09**	1.08E-10	**1.59E-09**
Formaldehyde	4.55E-02	7.00E-04	1.99E-07	**9.06E-09**	1.52E-08	**6.90E-10**	7.58E-09	**3.45E-10**
Gasoline Vapors	2.97E-03	2.83E-02	8.06E-06	**2.39E-08**	6.13E-07	**1.82E-09**	3.07E-07	**9.11E-10**
Methylene Chloride	3.50E-03	4.25E-01	1.21E-04	**4.23E-07**	9.20E-06	**3.22E-08**	4.60E-06	**1.61E-08**
Nickel	8.40E-01	5.00E-05	1.42E-08	**1.20E-08**	1.08E-09	**9.10E-10**	5.41E-10	**4.55E-10**
Propylene Oxide	1.30E-02	1.00E-05	2.85E-09	**3.70E-11**	2.17E-10	**2.82E-12**	1.08E-10	**1.41E-12**
Perchloroethylene	2.03E-03	2.04E-02	5.82E-06	**1.18E-08**	4.43E-07	**8.99E-10**	2.21E-07	**4.49E-10**
TOTAL				1.59E-06		1.21E-07		6.06E-08

WELLS SCHOOL			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Acrylonitrile	1.02E+00	4.00E-05	1.14E-08	**1.16E-08**	8.66E-10	**8.84E-10**	4.33E-10	**4.42E-10**
1,3 Butadiene	9.80E-01	5.00E-05	1.42E-08	**1.39E-08**	1.08E-09	**1.06E-09**	5.41E-10	**5.31E-10**
Benzene	1.02E-01	4.10E-03	1.17E-06	**1.18E-07**	8.88E-08	**9.01E-09**	4.44E-08	**4.51E-09**
Carbon Tetrachloride	1.47E-01	2.59E-03	7.37E-07	**1.08E-07**	5.61E-08	**8.25E-09**	2.80E-08	**4.12E-09**
1,4-Dioxane	2.70E-02	3.79E-03	1.08E-06	**2.91E-08**	8.21E-08	**2.22E-09**	4.10E-08	**1.11E-09**
Ethylene Dichloride	7.70E-02	1.80E-02	5.13E-06	**3.95E-07**	3.90E-07	**3.00E-08**	1.95E-07	**1.50E-08**
Ethylene Oxide	3.08E-01	4.40E-04	1.25E-07	**3.86E-08**	9.53E-09	**2.93E-09**	4.76E-09	**1.47E-09**
Cadmium	1.47E+01	1.00E-05	2.85E-09	**4.18E-08**	2.17E-10	**3.18E-09**	1.08E-10	**1.59E-09**
Formaldehyde	4.55E-02	4.40E-04	1.25E-07	**5.70E-09**	9.53E-09	**4.34E-10**	4.76E-09	**2.17E-10**
Gasoline Vapors	2.97E-03	1.17E-02	3.34E-06	**9.91E-09**	2.54E-07	**7.54E-10**	1.27E-07	**3.77E-10**
Methylene Chloride	3.50E-03	2.09E-01	5.94E-05	**2.08E-07**	4.52E-06	**1.58E-08**	2.26E-06	**7.91E-09**
Nickel	8.40E-01	2.00E-05	5.69E-09	**4.78E-09**	4.33E-10	**3.64E-10**	2.17E-10	**1.82E-10**
Propylene Oxide	1.30E-02	0.00E+00	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**
Perchloroethylene	2.03E-03	9.17E-03	2.61E-06	**5.30E-09**	1.99E-07	**4.03E-10**	9.93E-08	**2.02E-10**
TOTAL				9.90E-07		7.53E-08		3.77E-08

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: Inhalation of Indicator Chemicals for Sensitive Receptors
Calculation Endpoint: Incremental Cancer Risk

JACKSON SCHOOL			LCE		RME		AVG	
Carcinogens	**CPS**	**AAC**	**LADD**	**RISK**	**LADD**	**RISK**	**LADD**	**RISK**
Acrylonitrile	1.02E+00	4.00E-05	1.14E-08	**1.16E-08**	8.66E-10	**8.84E-10**	4.33E-10	**4.42E-10**
1,3 Butadiene	9.80E-01	5.00E-05	1.42E-08	**1.39E-08**	1.08E-09	**1.06E-09**	5.41E-10	**5.31E-10**
Benzene	1.02E-01	5.30E-04	1.51E-07	**1.53E-08**	1.15E-08	**1.17E-09**	5.74E-09	**5.83E-10**
Carbon Tetrachloride	1.47E-01	2.37E-03	6.74E-07	**9.91E-08**	5.13E-08	**7.55E-09**	2.57E-08	**3.77E-09**
1,4-Dioxane	2.70E-02	5.12E-03	1.46E-06	**3.93E-08**	1.11E-07	**2.99E-09**	5.54E-08	**1.50E-09**
Ethylene Dichloride	7.70E-02	2.57E-02	7.32E-06	**5.64E-07**	5.57E-07	**4.29E-08**	2.79E-07	**2.15E-08**
Ethylene Oxide	3.08E-01	4.10E-04	1.17E-07	**3.59E-08**	8.88E-09	**2.73E-09**	4.44E-09	**1.37E-09**
Cadmium	1.47E+01	1.00E-05	2.85E-09	**4.18E-08**	2.17E-10	**3.18E-09**	1.08E-10	**1.59E-09**
Formaldehyde	4.55E-02	5.50E-04	1.57E-07	**7.12E-09**	1.19E-08	**5.42E-10**	5.96E-09	**2.71E-10**
Gasoline Vapors	2.97E-03	1.50E-02	4.27E-06	**1.27E-08**	3.25E-07	**9.65E-10**	1.63E-07	**4.83E-10**
Methylene Chloride	3.50E-03	2.75E-01	7.83E-05	**2.74E-07**	5.96E-06	**2.09E-08**	2.98E-06	**1.04E-08**
Nickel	8.40E-01	3.00E-05	8.54E-09	**7.17E-09**	6.50E-10	**5.46E-10**	3.25E-10	**2.73E-10**
Propylene Oxide	1.30E-02	1.00E-05	2.85E-09	**3.70E-11**	2.17E-10	**2.82E-12**	1.08E-10	**1.41E-12**
Perchloroethylene	2.03E-03	1.30E-02	3.70E-06	**7.52E-09**	2.82E-07	**5.72E-10**	1.41E-07	**2.86E-10**
TOTAL				1.13E-06		8.60E-08		4.30E-08

ROHR INDUSTRIES - RIVERSIDE FACILITY
Exposure Scenario: Inhalation of Indicator Chemicals for Sensitive Receptors
Calculation Endpoint: Incremental Cancer Risk
CHEMICALS WITH SCREENING UNIT RISK FACTORS

PARADISE DAY SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	2.53E-02	7.20E-06	**2.52E-07**	5.48E-07	**1.92E-08**	2.74E-07	9.58E-09

ARLANZA SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	1.93E-02	5.48E-06	**1.92E-07**	4.17E-07	**1.46E-08**	2.08E-07	**7.30E-09**

CREST HAVEN SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	1.91E-02	5.43E-06	**1.90E-07**	4.13E-07	**1.45E-08**	2.07E-07	**7.24E-09**

FOOTHILL SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	1.86E-02	5.29E-06	**1.85E-07**	4.03E-07	**1.41E-08**	2.01E-07	**7.05E-09**

WELLS SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	9.36E-03	2.66E-06	**9.32E-08**	2.03E-07	**7.09E-09**	1.01E-07	**3.55E-09**

JACKSON SCHOOL

			LCE		RME		AVG	
Carcinogens	CPS	AAC	LADD	RISK	LADD	RISK	LADD	RISK
Isocyanates	3.50E-02	1.14E-02	3.25E-06	**1.14E-07**	2.48E-07	**8.66E-09**	1.24E-07	**4.33E-09**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Deposition of Chemical on Soil per Day

EQUATION

Dep = GLC * Dep-rate * CF1

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
GLC = Modeled ground-level concentration	µg/m^3	2.60E-04	2.60E-04	2.60E-04
Dep-rate = Vertical rate of deposition	m / sec	2.00E-02	2.00E-02	2.00E-02
CF1 = Conversion factor	sec / day	8.64E+04	8.64E+04	8.64E+04
Dep = Deposition on the affected soil area per day	µg/m^2-day	4.49E-01	4.49E-01	4.49E-01

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Average concentration in soil

EQUATIONS

$X = [\{EXP(-Ks * Tf) - EXP(-Ks * To)\} / Ks] + Tt$
$Ks = 0.693 / T½$
$Tt = Tf - To$
$Cs = Dep * X / (Ks * SD * BD * Tl)$

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
T½ = Chemical specific soil half-life	days	1.00E+08	1.00E+08	1.00E+08
Ks = Soil elimination constant	1/day	6.93E-09	6.93E-09	6.93E-09
To = Beginning of evaluation period	days	0	0	0
Tf = End of evaluation period	days	25550	10950	3285
Tt = Total days of exposure period	days	25550	10950	3285
X = Integral function	days	2.26E+00	4.15E-01	3.74E-02
SD = Soil mixing depth	m	1.50E-01	1.50E-01	1.50E-01
BD = Soil bulk density	kg/m^3	1.33E+03	1.33E+03	1.33E+03
Tl = Total days in lifetime	days	25550	27375	27375
Cs = Average modeled soil concentration over the evaluation period	µg/kg	**2.87E+01**	**4.92E+00**	**4.43E-01**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Concentration due to direct deposition

EQUATIONS

Cdepv = [Dep * IF / (k * Y)] * [1- EXP (-k * T)]

PARAMETERS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Dep = Deposition of chemical on vegetation	µg/m^2/day	4.49E-01	4.49E-01	4.49E-01
IF = Interception fraction	unitless	0.2	0.15	0.1
k = Weathering Constant	1/day	4.95E-02	4.95E-02	4.95E-02
Y = Yield	kg/m^2	2	2	2
EXP = Exponent base e	unitless	2.72E+00	2.72E+00	2.72E+00
T = Growth period of plant	days	90	67.5	45
Cdepv = Modeled concentration due to direct deposition	µg/kg	**9.0E-01**	**6.6E-01**	**4.0E-01**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Concentrations due to root uptake

EQUATIONS

Ctrans = Cs * UF2

PARAMETERS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Cs = Average modeled concentration of chemical in soil	µg/kg	2.87E+01	4.92E+00	4.43E-01
UF2 = Uptake factor	unitless	6.0E-02	6.0E-02	6.0E-02
Ctrans = Concentration due to root uptake	µg/kg	**1.7E+00**	**3.0E-01**	**2.7E-02**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Total concentration in plants

TOTAL CONCENTRATIONS IN PLANTS

EQUATIONS

Cf = Cdepv * BIO + Ctrans

PARAMETERS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Cdepv = Modeled concentration due to direct deposition	µg/kg	8.97E-01	6.57E-01	4.05E-01
BIO = Bioavailability factor of chemical	unitless	1	1	1
Ctrans = Concentration due to root uptake	µg/kg	1.72E+00	2.95E-01	2.66E-02
Cf = Concentration of chemical in/on vegetation	µg/kg	**2.6E+00**	**9.5E-01**	**4.3E-01**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Dose of chemical from ingestion of plants

EQUATIONS

D-p = Cf * IF * GI * L / BW * 1/CF1

PARAMETERS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Cf = Concentration of chemical in plant	µg/kg	2.62E+00	9.52E-01	4.31E-01
IF = Consumption of plant type	kg/day	0.34	0.34	0.34
GI = Gastrointestinal absorption factor	unitless	0.1	0.1	0.1
L = Fraction of plant type homegrown	unitless	0.4	0.4	0.25
BW = Average body weight	kg	70	70	70
CF1 = Conversion factor	µg/mg	1000	1000	1000
D-p = Dose due to plant ingestion	mg/kg-day	**5.1E-07**	**1.8E-07**	**5.2E-08**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Scenario: Ingestion of Cadmium in Homegrown Vegetables
Calculation Endpoint: Hazard Indices

EQUATIONS

HI = D-p / RfD

PARAMETERS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
D-p = Dose due to plant ingestion	mg/kg-day	5.09E-07	1.85E-07	5.24E-08
RfD = Chemical reference dose	mg/kg-day	1.00E-03	1.00E-03	1.00E-03
HI = Hazard index	unitless	**5.09E-04**	**1.85E-04**	**5.24E-05**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Dermal Contact with Cadmium in Soil
Calculation Endpoint: Deposition of Chemical on Soil per Day

EQUATION

Dep = GLC * Dep-rate * CF1

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
GLC = Modeled Ground-level concentration	µg/m^3	2.60E-04	2.60E-04	2.60E-04
Dep-rate = Vertical rate of deposition	m / sec	2.00E-02	2.00E-02	2.00E-02
CF1 = Conversion factor	sec / day	8.64E+04	8.64E+04	8.64E+04
Dep = Deposition on the affected soil area per day	µg/m^2-day	**4.49E-01**	**4.49E-01**	**4.49E-01**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Dermal Contact With Cadmium in Soil
Calculation Endpoint: Average Concentration in Soil Over the Evaluation Period

EQUATIONS

$X = [\{EXP(-Ks * Tf) - EXP(-Ks * To)\} / Ks] + Tt$
$Ks = 0.693 / T½$
$Tt = Tf - To$
$Cs = Dep * X / (Ks * SD * BD * Tl)$

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
T½ = Chemical specific soil half-life	days	1.00E+08	1.00E+08	1.00E+08
Ks = Soil elimination constant	days	6.93E-09	6.93E-09	6.93E-09
To = Beginning of evaluation period	days	0	0	0
Tf = End of evaluation period	days	25550	10950	3285
Tt = Total days of exposure period	days	25550	10950	3285
X = Integral function	unitless	2.26E+00	4.15E-01	3.74E-02
SD = Soil mixing depth	m	1.00E-02	1.00E-02	1.00E-02
BD = Soil bulk density	kg/m^3	1.33E+03	1.33E+03	1.33E+03
Tl = Total days in lifetime	days	25550	27375	27375
Cs = Average modeled soil concentration over the evaluation period	µg/kg	**4.31E+02**	**7.38E+01**	**6.64E+00**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Dermal Contact with Cadmium in Soil
Calculation Endpoint: Exposure dose through dermal absorption

EQUATION

Dose-dermal = Cs * SA * SL * ABS * ED * EY * 1/ABW * 1/CF2 * 1/AT

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Cs = Average modeled soil concentration over the evaluation period	µg / kg	4.31E+02	7.38E+01	6.64E+00
SA = Surface area of exposed skin	cm^2	4.66E+03	4.05E+03	1.98E+03
SL = Soil loading on skin	mg / cm^2-day	5.00E-01	5.00E-01	5.00E-01
ABS = Fraction absorbed across skin	unitless	1.00E-02	1.00E-02	1.00E-02
ED = Exposure duration	days/year	3.65E+02	5.20E+01	2.60E+01
EY = Exposure duration	years	7.00E+01	3.00E+01	9.00E+00
AT = Averaging Time	days	2.56E+04	1.10E+04	3.29E+03
ABW = Average body weight	kg	7.00E+01	7.00E+01	7.00E+01
CF2 = Conversion factor	µg / kg	1.00E+09	1.00E+09	1.00E+09
Dose-dermal = Exposure dose through dermal absorption	mg/kg-day	**1.43E-07**	**3.04E-09**	**6.69E-11**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Dermal Contact with Cadmium in Soil
Calculation Endpoint: Hazard Indices

EQUATION

HI = Dose-d / RfD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVG
Dose-d = Exposure dose through dermal absorption	mg/kg-day	1.43E-07	3.04E-09	6.69E-11
RfD = Reference dose	mg/kg-day	5.00E-03	5.00E-03	5.00E-03
HI = Hazard Index	unitless	**2.86E-05**	**6.08E-07**	**1.34E-08**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Incidental Ingestion of Cadmium in Soil
Calculation Endpoint: Deposition of Chemical on Soil per Day

EQUATION

Dep = GLC * Dep-rate * CF1

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
GLC = Modeled ground-level concentration	µg/m^3	2.60E-04	2.60E-04	2.60E-04
Dep-rate = Vertical rate of deposition	m / sec	2.00E-02	2.00E-02	2.00E-02
CF1 = Conversion factor	sec / day	8.64E+04	8.64E+04	8.64E+04
Dep = Deposition on the affected soil area per day	µg/m^2-day	**4.49E-01**	**4.49E-01**	**4.49E-01**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

Exposure Pathway: Incidental Ingestion of Cadmium in Soil
Calculation Endpoint: Average Concentration in Soil Over the Evaluation Period

EQUATIONS

$X = [\{EXP(-Ks * Tf) - EXP(-Ks * To)\} / Ks] + Tt$
$Ks = 0.693 / T½$
$Tt = Tf - To$
$Cs = Dep * X / (Ks * SD * BD * Tl)$

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
T½ = Chemical specific soil half-life	days	1.00E+08	1.00E+08	1.00E+08
Ks = Soil elimination constant	days	6.93E-09	6.93E-09	6.93E-09
To = Beginning of evaluation period	days	0	0	0
Tf = End of evaluation period	days	25550	10950	3285
Tt = Total days of exposure period	days	25550	10950	3285
X = Integral function	unitless	2.26E+00	4.15E-01	3.74E-02
SD = Soil mixing depth	m	1.00E-02	1.00E-02	1.00E-02
BD = Soil bulk density	kg/m^3	1.33E+03	1.33E+03	1.33E+03
Tl = Total days in lifetime	days	25550	27375	27375
Cs = Average modeled soil concentration over the evaluation period	µg/kg	**4.31E+02**	**7.38E+01**	**6.64E+00**

ROHR INDUSTRIES, INC. - RIVERSIDE FACILITY

HAZARD INDEX

Exposure Pathway: Incidental Ingestion of Cadmium in Soil

Calculation Endpoint: Hazard Index

EQUATION

Dose-s = Cs * Is * GI * BIO * CF2 * ED * EY/ (ABW * CF3 * AT)

HI = Dose-s / RfD

SYMBOLS AND DESCRIPTIONS	UNITS	LCE	RME	AVER
Cs = Average modeled soil concentration over the evaluation period	µg/kg	4.31E+02	7.38E+01	6.64E+00
Is = Lifetime average ingestion rate per day for soil	mg/day	1.50E+02	1.00E+02	1.00E+02
GI = Gastrointestinal absorption factor	unitless	1.00E+00	1.00E+00	1.00E+00
BIO = Bioavailability	unitless	1.00E+00	1.00E+00	1.00E+00
CF2 = Conversion factor	kg/mg	1.00E-06	1.00E-06	1.00E-06
ABW = Average body weight	kg	7.00E+01	7.00E+01	7.00E+01
CF3 = Conversion factor	µg/mg	1.00E+03	1.00E+03	1.00E+03
ED = Exposure Duration	days/year	3.65E+02	5.20E+01	2.60E+01
EY = Exposure Duration	years	7.00E+01	3.00E+01	9.00E+00
AT = Averaging Time	days	2.56E+04	1.10E+04	3.29E+03
Dose-s = Exposure dose through ingestion of soil	mg/kg-day	9.23E-07	1.50E-05	6.76E-10
RfD = Reference Dose	mg/kg-day	1.00E-03	1.00E-03	1.00E-03
HI = Hazard Index	unitless	**9.23E-04**	**1.50E-05**	**6.76E-07**

APPENDIX D

ISOPLETH MAPS

APPENDIX E

TOXICOLOGICAL PROFILES

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E.0 TOXICOLOGICAL PROFILES

E.1 TOXICOLOGICAL PROFILE FOR METHYLENE CHLORIDE

Methylene chloride (dichloromethane or DCM) is widely used in paint removers, as a solvent for plastics, as a degreasing agent, in propellant mixtures for aerosol sprays, and as a blowing agent in foams (ACGIH, 1986). Methylene chloride is also used in the manufacture of plastics, textiles, photographic film, photoresistant coatings, as a decaffeinating agent for spices and hops, and as a solvent carrier in the manufacture of herbicides and insecticides (EPA, 1983a). The primary source of methylene chloride is considered to be anthropogenic; natural sources that may exist are thought to contribute little to the environment.

Methylene chloride is a colorless, volatile liquid that has a mild, sweet odor. The odor threshold is between 200 and 300 ppm. It is soluble in water and a variety of organic solvents including alcohols and ethers. The log K_{ow} for methylene chloride is 1.30. Its vapor pressure is 436 mmHg at 23°C and its boiling point is 40°C. The chemical and physical properties of methylene chloride are listed in TABLE E-1.

E.1.1 *Environmental Fate*

Because of its volatility and dispersive use pattern, the majority of the methylene chloride produced is emitted into the atmosphere. Of the methylene chloride produced in the United States, approximately 85 percent is estimated to enter the environment through sewage treatment plants and is then discharged to surface waters, deposited on land, or emitted to the atmosphere (EPA, 1983b).

Emissions of methylene chloride to the atmosphere readily disperse and may be transported long distances from the source. Degradation occurs through reaction with hydroxyl radicals. This reaction is considered the primary tropospheric chemical scavenging process for methylene chloride (ATSDR, 1987). A small percentage (1%) of methylene chloride will diffuse to the stratosphere where it will rapidly degrade by photolysis and reaction with chlorine radicals. Because it is moderately soluble in water, methylene chloride is expected to return to earth in rain (HSDB, 1987). Methylene chloride is not expected to accumulate significantly in the atmosphere. The lifetime of methylene chloride in the troposphere,

under typical conditions, ranges from a minimum of a few months to a maximum of 1.4 years (EPA, 1985a, as cited in ATSDR, 1987).

Soil fate processes are expected to include volatilization, leaching, and biodegradation. Adsorption to soil is not expected to be significant, and leaching and transport into groundwater may occur. Bioaccumulation and bioconcentration of methylene chloride are not predicted to be significant in aquatic environments due to its low octanol-water coefficient.

TABLE E-1

PHYSICAL AND CHEMICAL PROPERTIES OF METHYLENE CHLORIDE

PROPERTY	VALUE	REFERENCE
Molecular Formula	CH2CL2	EPA, 1983
Molecular Weight	84.93 g/mol	ATSDR, 1987
Appearance	Colorless liquid	ATSDR, 1987
Odor	Mild, sweet	MSDS, 1989
Odor Threshold	≈200 - 300 ppm	MSDS, 1989
Melting Point	-95 to -97°C	CEPA, 1983
Boiling Point	40°C (@ 760 mmHg)	ATSDR, 1987
Solubility		
Water (20-30°C)	20,000 mg/L	ATSDR, 1987
Organic Solvents	Miscible with a wide variety of organic solvents	ATSDR, 1987
Vapor Pressure	20°C (349 mmHg) 25°C (436 mmHg) 30°C (531 mmHg)	EPA, 1983b
Vapor Density (Air = 1)	2.9	MSDS, 1989
Specific Gravity	1.32 @ 25°C	MSDS, 1989
Partition Coefficients		
octanol-water (K_{ow})log	1.30	ATSDR, 1987
organic-carbon (K_{oc})	8.8 g/ml	ATSDR, 1987
Flashpoint (Method used)	None (TCC)	MSDS, 1989
Flammable Limits in Air	12-19% (vol) @ 100°C	MSDS, 1989
Evaporation Rate (ether = 1)	0.7	MSDS, 1989
% Volatile by Volume	100	MSDS, 1989

E.1.2 *Toxicokinetics*

Methylene chloride is thought to be metabolized via two pathways: (1) an oxidative, mixed function oxidase (MFO) microsomal pathway mediated by the P-450 system that yields CO and CO_2, and (2) a cytosolic glutathione-S-transferase (GST) pathway that yields CO_2 (ATSDR, 1987). Each pathway is capable of producing a metabolically active intermediate that is theoretically capable of binding irreversibly to cellular macromolecules (Ahmed *et al.*, as cited in EPA, 1987b). At low exposures the two pathways are thought to be active (EPA, 1987a). Biochemical and toxicological studies have suggested that GST metabolites are responsible for the toxicity of methylene chloride (Reitz *et al.*, 1989), but the data are limited (EPA, 1987a).

Methylene chloride is readily absorbed in the respiratory and gastrointestinal (GI) tract. In humans, blood concentrations of methylene chloride increase linearly with inhalation of low concentrations. At high exposure concentrations, saturation of the blood occurs (ATSDR, 1987). Duration of exposure, physical activity (increased ventilation and cardiac output), and amount of body fat are directly related to the absorption of methylene chloride (EPA, 1983b).

Absorption of methylene chloride through skin from direct liquid contact or immersion occurs at a slower rate than other exposure routes (EPA, 1983b). Maksimov *et al.* (1977, cited in ATSDR, 1987) measured small concentration increases in most tissues 1 and 2 hours after immersing rat tails in methylene chloride. Concentrations of methylene chloride in fatty tissues increased markedly up to 3 hours post-exposure and tissue levels remained elevated for up to 4 hours post-exposure.

The distribution of methylene chloride in tissues is consistent with its lipophilic nature and moderate water solubility (EPA, 1983b). Following inhalation of ^{14}C-methylene chloride at 500 ppm for 1 hour in rats, radioactivity was detected in the liver, brain, and fatty tissues (Carlsson and Hultengren, 1975, as cited in ATSDR, 1987). There is some evidence of methylene chloride accumulation in human lipid tissues. Engstrom and Bjurstrom (1977, as cited in ATSDR, 1987) exposed 6 slim and 6 obese subjects to 2600 mg/m^3 (750 ppm) methylene chloride for 1 hour. Following exposure, adipose tissue contained 28 to 35% of the total uptake and correlated with degree of obesity and body weight.

Elimination of methylene chloride from the body is dominated by two processes: first order pulmonary elimination of unchanged methylene chloride and hepatic metabolism (EPA, 1985a). Following GI tract absorption, methylene chloride may undergo first-pass hepatic metabolism and elimination before reaching systemic circulation (ATSDR, 1987).
Following single oral (gavage) doses of 1 or 50 mg/kg ^{14}C-methylene chloride in rats, recovery in urine, feces, and exhaled air was virtually complete (92 to 96 percent) (McKenna and Zempel, 1981, as cited in EPA, 1983b). The highest concentrations of radioactivity were detected in the liver, kidney and lung and the lowest was found in the lipid tissues (McKenna and Zempel, 1981, as cited in ATSDR, 1987). Other tissue distribution studies from administration of oral doses for 14 days revealed distributions of the dose in the blood, liver and carcass (Angelo *et al.*, 1986a,b, as cited in ATSDR, 1987).

Human inhalation exposure studies (n = 11) conducted by DeVincenzo *et al.* (1972) detected less than 2% unaltered methylene chloride in urine samples (ATSDR, 1987). In rats administered oral doses of 1 or 50 mg/kg methylene chloride, McKenna and Zempel (1981) found 12.3 and 72% of unchanged methylene chloride in expired air; less than 1% was in feces; and 5% and 2% in urine at the two dose levels (ATSDR, 1987).

E.1.3 *Genotoxicity*

Methylene chloride produced weak positive results in the investigation of point mutations in Salmonella and other bacteria (EPA, 1987a). Three strains of Salmonella when exposed to methylene chloride vapor in gas tight chambers, exhibited a dose related response in the presence and absence of metabolic-activating enzymes (EPA, 1985a). Point mutation and mitotic recombinant assays of yeast have produced mixed results. Sex-linked recessive lethal mutations in Drosophila have also produced mixed results. The positive studies reveal that methylene chloride is a weak mutagen in non-mammalian species.

Methylene chloride has produced mixed results with in vitro mammalian test systems and largely negative results in mammalian cells in vivo (EPA, 1987b). Chromosomal damage studies have shown methylene chloride to be clastogenic (causing chromosomal breakage) both with and without the presence of a metabolic system. In vitro tests for unscheduled DNA synthesis (UDS) (indicative of DNA repair) proved negative in assays of rat hepatocytes, human fibroblasts, and human lymphocytes (EPA, 1987b). Chromosomal mutation assays gave mixed results with one positive study in Chinese hamster cells (EPA, 1987b).

In vivo rat and mice mutagenicity studies have produced negative results. UDS studies conducted on rat hepatocytes in vivo and DNA binding studies have not induced genotoxic effects in rat and mouse liver and lung (Green *et al.*, 1988). One study indicated significant evidence of mitosis in the livers of B6C3F1 mice but due to study limitations the EPA did not consider the results to be definitive (EPA, 1987a). Given the evidence of in vitro clastogenicity and the insensitivity of the in vivo UDS and DNA binding studies, it was concluded that methylene chloride may be a weak mutagen in mammalian systems (EPA, 1987b).

E.1.4 *Acute and Chronic Toxicity in Animals*

Acute Toxicity

A literature review of the acute effects of methylene chloride in animals indicated a varied response. The Hazardous Substance Data Base reports an oral LD_{50} for rats of 167 mg/kg (HSDB, 1987). Kimura *et al.* (1971, as cited in ATSDR, 1987) report an oral LD_{50} for rats of 2,121 mg/kg. When laboratory animals inhaled methylene chloride, LC_{50} values ranged from 11,600 ppm to 16,000 ppm (ATSDR, 1987).

Because of its high volatility, the primary exposure route for methylene chloride is via inhalation. Short-term inhalation studies show that methylene chloride produced central nervous system effects above 6,000 ppm for 2.5 hours (Weinstein *et al.*, 1972a, as cited in ATSDR, 1987) and behavioral effects above 500 ppm 6 hours daily for 4 days (Savoleinen *et al.*, 1977, as cited in ATSDR, 1987). Acute and chronic studies show the liver to be a target organ following methylene chloride exposure. Histomorphological changes occur following short-term inhalation exposure at high dose levels (5200 ppm) for six hours to seven days (Weinstein *et al*, 1972, as cited in ATSDR, 1987) and alterations in cytochrome activity occur at lower levels (500 ppm for 10 days) (Norpoth *et al.*, 1974, as cited in ATSDR, 1987). Inhalation of 100 ppm for 100 days has produced liver effects (Weinstein and Diamond, 1972b, as cited in ATSDR, 1987).

Chronic Toxicity

Long-term exposure to methylene chloride has been studied in mice, rats and hamsters. Ingestion of methylene chloride in drinking water was studied in F344 rats and B6C3F1 mice. Inhalation of methylene chloride has been evaluated in five studies involving B6C3F1

mice, Sprague-Dawley (S-D) rats, Fisher 344 (F344) rats, and Syrian hamsters. These studies have focused on the evaluation of the carcinogenic effects of methylene chloride. Other toxic effects have been reported in some of these studies.

In a study performed by Dow Chemical, S-D rats inhaled 0, 500, 1,500, and 3,000 ppm methylene chloride for 6 hours per day, 5 days per week, for two years. There was an increase in sarcomas of the salivary gland region in male rats. Since this finding was highly unusual and not supported by other studies, it was postulated that a sialodacryoadenitis infection acted with the methylene chloride exposure to produce these tumors. Both control and treated female mice exhibited a high incidence of benign mammary tumors. A dose-related increase of benign mammary tumors per tumor bearing animal was observed. An insignificant increase of benign mammary tumors in male rats at the highest dose level of 3500 ppm was also observed (Burek *et al.* 1984; EPA, 1985a). No increase in incidence of any malignant tumors were observed in either sex at any dose level.

Nitschke, *et al* (1988) reported another Dow study in which S-D rats inhaled 0, 50, 200, and 500 ppm methylene chloride 6 hours daily, 5 days per week, for two years. There was an increased incidence in hepatocellular vacuolization in male and female rats exposed to 500 ppm methylene chloride. Exposure to 500 ppm caused an increase in multinucleated hepatocytes and spontaneous benign tumors in female rats. No increased incidence in malignant tumors was observed in either sex at any dose level.

In a 1986 National Toxicology Program (NTP) study, F344 rats were exposed to methylene chloride levels of 0, 1000, 2000, or 4000 ppm for 6 hours per day, 5 days per week, for 102 weeks (Mennar, *et al.* 1988). Both female and male mice exhibited a dose-related increased incidence of benign mammary tumors.

B6C3F1 mice were also studied by NTP. Dose levels were 0, 2000, or 4000 ppm for 6 hours per day, 5 days per week, for 102 weeks. There was a significant increase in the incidence of lung and liver tumors in both sexes. There were also dose-related increases in multiple tumors (Mennar *et al.*, 1988).

The National Coffee Association (NCA) sponsored a study in which F344 rats were exposed to methylene chloride in their drinking water for two years. Dose levels of 0, 5, 50, 125, and 250 mg/kg-day were administered to a total of 500 animals per sex (Serota, 1986). Treatment-related changes in hepatic histomorphology were observed in both sexes after 78

weeks of treatment. At doses of 50 and 250 mg/kg-day female rats showed a significant increase of liver tumors in a dose dependent fashion when compared to study controls ($p < 0.05$) but not when compared to historic controls. The incidence of liver tumors was not increased in the 125 mg/kg-day group. The authors concluded that the observed response in the 50 and 250 mg/kg-day groups was not associated with ingestion of methylene chloride.

In another study sponsored by the NCA, Serota *et al.*, studied the effect of ingestion of methylene chloride in drinking water (1986b, as cited in EPA, 1985a). B6C3F1 mice ingested 0, 60, 125, 185, and 250 mg methylene chloride/kg-day. Male mice exhibited a significant ($p < 0.05$) increase in hepatic tumors at dose levels of 125 and 185 mg/kg-day when compared to study controls, but not when compared to historical controls. At 250 mg/kg-day, there was an increase in hepatic tumors in males but the statistical p value was above the chosen test significance level of 0.05. Female mice showed no treatment-related increase in tumor incidence.

In light of the evidence presented by these studies, IARC (1986) and EPA (1987b) have determined that there is sufficient evidence of methylene chloride carcinogenicity in experimental animals.

Developmental and Reproductive Effects

In a study conducted by Schwetz (1975), Swiss Webster mice inhaled 1,250 ppm of methylene chloride for 7 hours per day during days 6 through 15 of gestation. Maternal effects included significant increases in maternal body weight, maternal absolute liver weight, and increases in COHb levels which returned to control levels within 24 hours. A statistically significant number of litters contained fetuses with a single extra center of ossification. Since this common finding in mice is thought to reflect embryonic development, this observation may have been due to an acceleration of development or due to a chance occurrence.

Schwetz *et al.* (1975) observed a significant increase in dilated renal pelvis among Sprague-Dawley rats exposed to methylene chloride but this finding may have been due to a delay in development (EPA 1985a). Also observed was a significant increase in absolute (but not relative) maternal liver weight when compared to controls. No effect on maternal body weight was observed. As in the mice study, maternal COHb levels were elevated but

returned to the level of control values within 24 hours. There was no effect on reproductive parameters such as litter size, number of resorptions, implantation sites per litter, fetal sex ratios, and fetal body weight.

Hardin and Manson (1980) conducted a study in which female rats were exposed to 4,500 ppm methylene chloride through inhalation for 6 hours per day, for 7 days per week. Treatment groups consisted of rats that were exposed only prior to gestation, rats that were exposed both prior to and during gestation through day 17, and rats that were exposed only during gestation through day 17. Maternal liver weights were significantly increased and fetal weights were significantly decreased in both treatment groups exposed to methylene chloride during gestation. There was no other significant adverse effects observed.

In a two generation study, Nitschke *et al.* (1988) evaluated fertility, litter size, neonatal growth, and survival of F344 rats exposed to methylene chloride by inhalation. Dose levels were 0, 100, 500, or 1,500 ppm and the exposure duration was 6 hours per day, 5 days per week, for 14 weeks. No adverse effects on reproductive parameters, neonatal survival, or neonatal growth were observed. There were no treatment related gross pathologic observations in adults and weanlings. Histopathologic examination of tissues from the weanlings did not reveal lesions attributed to methylene chloride.

E.1.5 *Acute and Chronic Toxicity in Humans*

Acute Toxicity

Case studies of acute methylene chloride poisoning from paint remover have demonstrated that inhalation of high concentrations or ingestion of large doses can be fatal. The lethal concentrations, however, were not reported (ATSDR, 1987). Methylene chloride acts primarily on the central nervous system (CNS), causing narcosis at high doses (Fodor and Winneke, 1971; Winneke, 1974; Putz *et al.*, 1976, as cited in IARC, 1986) and temporary neurobehavioral effects at doses as low as 200 ppm (Winneke, 1974; Putz *et al.*, 1976, as cited in IARC, 1986).

Chronic Toxicity in Humans

Ott *et al.* (1983, as cited in EPA, 1985a) examined employees occupationally exposed to levels of methylene chloride that ranged from 60 to 475 ppm (208 to 1650 mg/m^3). A dose-

related increase in serum bilirubin was observed in exposed individuals. A consistent positive association between total bilirubin and methylene chloride exposure was also observed but tests that could have provided more insight into this finding were not performed (EPA, 1985a)

Taskinene *et al.* (1986) studied the possible causes of spontaneous abortions among women working in the Finnish pharmaceutical industry (IARC, 1986). A case-control study design was used in which 44 women who had spontaneous abortions were each matched with three controls by age of conception. The odds ratio based on methylene chloride exposure, and 11 exposed cases was 2.3 (95% c.i., 1.0-5.7; $p = 0.06$). The results of the study indicated an increased risk associated with exposure to other solvents as well.

Two cohort studies examined the mortality incidence in workers occupationally exposed to methylene chloride. Friedlander *et al.* (1978) carried out a study on an Eastman Kodak cohort using proportionate mortality and non-current prospective cohort mortality analyses. Prospective mortality analysis was performed on 334 deaths in male workers exposed to between 30 to 125 ppm methylene chloride for up to 30 years. No significant difference was found between observed and expected numbers for any specific cancer site. The prospective cohort mortality study included all 751 "hourly" male workers employed in the methylene chloride area. When compared to industrial controls the cohort showed no excess cancer mortality. When compared to upstate New York males the cohort had significantly lower standard mortality ratios (SMR) for malignant neoplasms and circulatory disease. Ott *et al.* (1983, as cited in IARC, 1986) reported the results of a cohort mortality study of 1271 employees in a fiber production plant where the range of exposure was approximately 140-475 ppm. No excess risk of death from malignancies was observed.

In a follow-up evaluation of the Eastman Kodak cohort, Hearne *et al.* (1987) reported no unusual mortality patterns for hypothesized (a priori) causes of death such as lung and liver malignancy and ischemic heart disease. None of the observed-expected differences for non-hypothesized causes was significant. However, there were 8 pancreatic cancer deaths in the cohort as compared to 3.2 and 3.1 expected in the New York state and industrial controls, respectively. While this finding was not significant and could be due to chance, further assessment of the pancreatic findings was considered warranted (Hearne *et al.*, 1987).

IARC (1986) determined that there is inadequate evidence for the carcinogenicity of methylene chloride to humans. However, IARC suggests that in the absence of adequate

data on humans, it is reasonable to treat chemicals or exposures as if they present a carcinogenic risk to humans. On this basis, IARC has classified methylene chloride as a class 2B carcinogen: possible human carcinogen.

EPA (1985b, 1987) has determined that there is inadequate evidence of methylene chloride carcinogenicity in humans. Therefore, based on the sufficient animal evidence and inadequate human evidence EPA has classified methylene chloride in Group B2: probable human carcinogen.

E.1.6 *Dose-Response Assessment*

E.1.6.1 *Reference Dose (RfD)*

The EPA RfD is based on a twenty-four month ingestion study of the toxicity and oncogenicity of methylene chloride (Serota *et al.*, 1986). Methylene chloride was administered in deionized water at levels of 0, 5, 50 125, and 250 mg/kg-day. A toxicological and non-neoplastic NOEL was observed at a dose of 5 mg/kg-day. Adjustment for reflection of actual values resulted in an NOAEL of 5.85 mg/kg-day for males and 6.47 mg/kg-day for females. The study was considered to be of high quality, therefore a safety factor of 100 was used to account for inter- and intraspecies variation. The EPA derived oral RfD is 0.06 mg/kg-day.

To date, no inhalation exposure RfD's has been published for methylene chloride. An inhalation RfD, however, was derived from oral RfD study results and pulmonary and oral absorption data.

E.1.6.2 *Unit Risk Factor*

The EPA Carcinogen Assessment Group (IRIS, 1991) calculated a unit risk estimate for methylene chloride. This was obtained by fitting liver and lung tumor data from female B6C3F1 mice in the NTP (1986) inhalation study using the linearized multistage model and pharmacokinetic and metabolism data. The unit risk of 4.7×10^{-7} per $\mu g/m^3$ of exposure was calculated (IRIS, 1991). The EPA risk estimate is based on the linearized multistage model and should be regarded as conservative, representing a plausible upper limit for the risk. The true risk is not likely to be higher than the estimate, but it may be lower (ATSDR, 1987). TABLE E-2 presents the criteria and guidelines for methylene chloride.

TABLE E-2

CRITERIA AND GUIDELINES FOR METHYLENE CHLORIDE

AGENCY	DESCRIPTION	VALUE	SOURCE
EPA	Cancer Ranking	Group B2	ATSDR, 1987
IARC	Cancer Ranking	Group 3	IARC, 1986
EPA	Unit Risk Factor	4.7×10^{-7} $(\mu_L/mg^3)^{-1}$	EPA, 1985
OSHA	TWA Ceiling Max Peak	550 ppm 1000 ppm 2000 ppm	29 CFR 1919.1000
ACGIH	TLV-TWA	50 ppm	ACGIH, 1986
NIOSH	IDLH	5000 ppm	NIOSH, 1985
EPA	OWRS Ambient water Quality criteria for protection of human health		EPA, 1980
	Ingesting water and organisms	0.19 μg/l	
	Ingesting organisms only	15.7 μg/l	
EPA ODW	Health Advisories (HAs)		EPA, 1985
	One-day (child)	13.3 mg/l	
	Ten-day (child)	1.5 mg/l	
	DWEL	1.75 mg/l	
NAS	Suggested no-adverse response level (SNARL)		NAS, 1980
	One-day	45.4 mg/l	
	Seven-day	6.5 mg/l	

E.1.7 REFERENCES

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E.2 ETHYLENE DICHLORIDE SUMMARY TOXICOLOGICAL PROFILE

Ethylene dichloride (EDC, 1,2-Dichloroethane or 1,2-DCA) is a clear, oily, synthetic liquid and is mainly used to produce vinyl chloride. EDC is a component of several solvents that remove grease, glue, and dirt. It evaporates at room temperature. Previously, it was also a trace component of solvents that are used to clean cloth, remove grease from metal, and to break down oils, fats, waxes, resins, and rubber. EDC is also added to leaded gasoline to remove the lead (EPA, 1989). EDC has a relatively low log K_{ow} which suggests that it will be mobile in aqueous environments. In addition, it is not expected that EDC will bioaccumulate. Both aerobic and anaerobic biodegradation half-lives in soil have been reported to be as short as 100 and 400 days, respectively. The majority of EDC released to the environment is via volatilization. Photooxidation is the predominant fate process in the atmosphere with a lifetime up to 4 months, as reported by various investigators (Class and Ballschmiter 1986; Cupitt 1980; EPA 1975; Howard and Evenson 1976 as cited by EPA, 1989). Hydrolysis and biodegradation do not seem to be important environmental fate processes of ethylene dichloride (EPA, 1989). Physical and chemical properties of EDC are presented in TABLE E-3.

Ethylene dichloride has been observed to cause adverse health effects in animals and humans. In a number of animal species, acute inhalation exposure to EDC resulted in death (Heppel et al.,, 1945, 1946; Spencer et al., 1951). Liver and kidney effects such as increased organ weight and necrosis were observed. In addition, other effects of acute inhalation exposure to EDC were pulmonary congestion, fatty infiltration and degeneration of the myocardium (Heppel et al., 1945, 1946; Spencer et al., 1951). Ingestion of EDC by animals has also been observed to result in death. This chemical also causes tumors of the lung when applied to the skin of laboratory animals. The acute oral LD_{50} for rats is approximated to be 680 mg/kg (McCollister et al.,, 1956). Chronic oral exposure to EDC in mice and rats has resulted in deaths (NCI, 1978). In humans, inhalation of EDC can result in death due to cardiac arrhythmia (Nouchi et al.,, 1984). The study conducted by Nouchi et al., (1984) also indicated that acute inhalation exposure to EDC can induce neurotoxic, nephrotoxic, and hepatotoxic effects. Other associated effects in humans include respiratory distress, nausea, and vomiting. Epidemiological studies in humans indicate that repeated exposure to EDC is associated with an increased incidence of brain tumors among chemical plant workers (EPA, 1989). People who have their skin exposed to high levels of EDC for a long period may develop benign tumors (EPA, 1989). EDC is classified as an EPA-

defined class B2 substance; probable human carcinogen, based on sufficient animal evidence and inadequate or lacking human evidence. EPA (1988a) has determined the (q_1^*) for oral and inhalation exposure to be 0.091 $(mg/kg\text{-}day)^{-1}$. This value is based on experimental studies in which rats were administered EDC by gavage. Tumors were observed in the circulatory system of the rats (EPA, 1990). A summary of criteria and guidelines is provided in TABLE E-4.

TABLE E-3

PHYSICAL AND CHEMICAL PARAMETERS OF ETHYLENE DICHLORIDE

PROPERTY	UNITS	REFERENCE
CASH#	107-06-02	HSDB, 1988
molecular formula	$C_2H_4Cl_2$	Merck, 1983
molecular weight	98.96	Merck, 1983
aqueous solubility	0.869 g/100 ml (20°C)	Kirk-Othmer, 1985
vapor pressure	61 mm Hg (20°C) 40 mm HG (10°C) 105 mm HG (30°C)	Mabey, et al.,, 1982 Verschueren, 1983 Verschueren, 1983
specific gravity	1.25 (20°C)	Kirk-Othmer, 1979 Verschueren, 1983
Partition coefficients: Log octanol/water (K_{ow})	 1.48 1.45	Hansch and Leo, 1979 Banerjee *et al.*, 1980
Log K_{oc}	1.14 1.28	Mabey, *et al.*, 1982 Chiou, *et al.*, 1979
half lives		
soil	High: 4320 hours (6 months) Low: 2400 hours (100 days)	EPA, 1989 EPA, 1989
surface water	High: 4320 hours (6 months) Low: 2400 hours (100 days)	T. Mudder, 1981 J.T. Wilson, *et al.*, 1983A
groundwater	High: 8640 hours (12 months) Low: 2400 hours (100 days)	EPA, 1989 J.T. Wilson, *et al.*, 1983A
aerobic	High: 4320 hours (6 months) Low: 2400 hours (100 days)	T. Mudder, 1981 J.T. Wilson, *et al.*, 1983A
anaerobic	High: 17280 hours (24 months) Low: 9600 hours (400 days)	EPA, 1989 EPA, 1989
atmospheric	High: 2917 hours (122 days) Low: 292 hours (12.2 days)	EPA, 1989 EPA, 1989
Henry's Law Constant	4.5 x 10^{-2} atm m^3/mol @ 25°C	Shen, 1982
melting point	-35.3°C	Merck, 1983
boiling point	83-84°C	Merck, 1983

TABLE E-4

SUMMARY OF CRITERIA AND GUIDELINES FOR ETHYLENE DICHLORIDE

Agency Regulations	Description	Value	References
Oral			
EPA ODW	Maximum Contaminant Le	0.005 mg/L	EPA, 1987b
Inhalation			
OSHA	Permissible Exposure Limit		OSHA, 1989
	Time weighted average (TWA)	1 ppm	
	Peak (5 minutes in any 3 hours)	2 ppm	
Other			
EPA OERR	Reportable quantity	5,000 lb	EPA, 1985b
	Reportable quantity (proposed)	100 lb	EPA, 1987c
Guidelines			
Oral			
EPA	q_1 (oral)	$9.1 \times 10_{-2}$ (mg/kg-day)$^{-1}$	EPA, 1988a
EPA ODW		0 mg/L	
	Maximum Contaminant Level Goal (MCLG)		EPA 1985c
	Health Advisories	0.74 mg/L	EPA, 1987d
	1 day	0.74 mg/L	
	10 day		
	Longer term	2.6 mg/L	
	Adult	0.74 mg/l	
	Child		
EPA OWRS	Ambient Water Quality Criteria to		EPA 1980a
	Protect Human Helath:	0.94 ug/L	
	Ingestion of water and aquatic organisms	0.245 ug/L	
	Ingestion of aquatic organisms only		
Inhalation			
ACGIH	Threshold Limit Value(TLV), TWA	10 ppm (40 mg/m^3)	ACGIH, 1986
EPA	q_1* (inhalation)	9.1×10^{-2} (mg/kg-day)$^{-1}$	EPA, 1988a
NIOSH	Recommended Exposure Limit		
	TWA	1 ppm	NIOSH, 1987b
	Ceiling	1 ppm	
	Immediately Dangerous to Life or Health (IDLH) Level	1000 ppm	NIOSH, 1981a
Other			EPA, 1988a
EPA	Carcinogenic Classification	Group B2	IARC, 1982
IARC	No Carcinogenic Classification		
Oral			
CA State	Drinking water quality standard & guidelines	1 ug/L	FSTRAC, 1988

E.2.1 *References*

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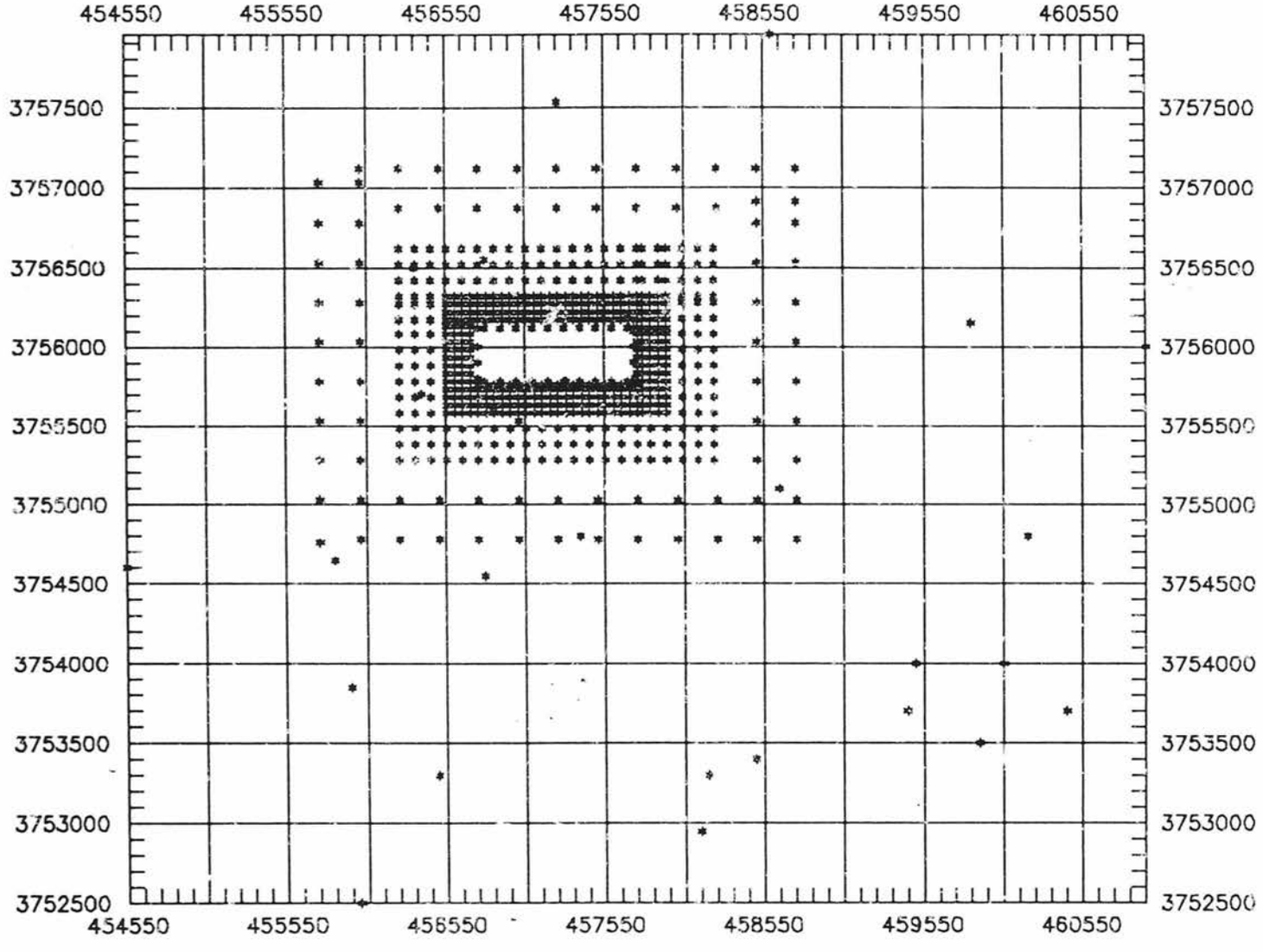
APPENDIX F

SCAQMD REQUIRED FORMS

ROHR FACILITY GRID SPACING 3-12-92



SCALE 1 inch = 900 METERS

FACILITY EMISSIONS SUMMARY FORM

EMISSIONS REPORTED IN AN ATIR COMPARED WITH
EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC. - RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
AIR TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
GLYCOL ETHERS	1115	1.12	7901	1.12	7901
HEXAVALENT CHROMIUM	18540299	(From Addendum Report 6/7/91) 0.003794	17.455	0	0
HYDROGEN FLUORIDE	7664393	10.2	41,841	$4.72\ E^{-3}$	39.68
ISOCYANATES	1125	0.10	477	0.10	477
LEAD	7439921	2.3 E-5	0.11	2.3 E-5	0.11
MANGANESE	7439965	4.7 E-4	0.429	4.7 E-4	0.429
METHANOL	67561	0.065	319.5	0.065	319.5

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES. DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY IS THE INFORMATION USED IN THE HRA.

REVIEWING ENGINEER _____

HRA 89 FORM 1

FACILITY EMISSIONS SUMMARY FORM

EMISSIONS REPORTED IN AN ATIR COMPARED WITH
EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC. - RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
R TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
METHYL CHLOROFORM	71556	32.8	116,087	32.8	116,087
1,3 - BUTADIENE	106990	4.7 E-4	0.37	4.7 E-4	0.37
1,4 DIOXANE	123911	0.041	119	0.041	119
ACRYLONITRILE	107131	4.7 E-4	2.2	4.7 E-4	2.2
BENZENE	71432	0.0079	45.1	0.0079	45.1
BROMINE	7726956	0.019	174	0.019	174
CARBON TETRACHLORIDE	56235	0.0198	39.8	0.0198	39.8

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES.
DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY
IS THE INFORMATION USED IN THE HRA.

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FACILITY EMISSIONS SUMMARY FORM

EMISSIONS REPORTED IN AN ATIR COMPARED WITH
EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC. RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
AIR TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
CHLORINE	7782505	0.012	110.4	0.012	110.4
COPPER	7440508	5.4 E-4	0.59	5.4 E-4	0.59
ETHYLENE DICHLORIDE	107062	0.163	1170	0.163	1170
ETHYLENE OXIDE	75218	0.0034	6.8	0.0034	6.8
FLUOROCARBONS	1105	4.90	23,707	4.90	23,707
FORMALDEHYDE	50000	0.017	103.8	0.017	103.8
GASOLINE VAPORS	1110	0.11	640	0.11	640

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES.
DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY
IS THE INFORMATION USED IN THE HRA.

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FACILITY EMISSIONS SUMMARY FORM

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EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC. - RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
AIR TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
GLYCOL ETHERS	1115	1.12	7901	1.12	7901
HEXAVALENT CHROMIUM	18540299	(From Addendum Report 6/7/91) 0.003794	17.455	0	0
HYDROGEN FLUORIDE	7664393	10.2	41,841	10.2	41,841
ISOCYANATES	1125	0.10	477	0.10	477
LEAD	7439921	2.3 E-5	0.11	2.3 E-5	0.11
MANGANESE	7439965	4.7 E-4	0.429	4.7 E-4	0.429
METHANOL	67561	0.065	319.5	0.065	319.5

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES.
DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY
IS THE INFORMATION USED IN THE HRA.

REVIEWING ENGINEER _____

HRA 89 FORM 1

FACILITY EMISSIONS SUMMARY FORM

EMISSIONS REPORTED IN AN ATIR COMPARED WITH
EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC. - RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
AIR TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
METHYLENE CHLORIDE	75092	2.70	13551	2.70	13551
NAPHTHALENE	91203	1.70	9361	1.70	9361
NICKEL	7440020	1.7 E-4	0.41	1.7 E-4	0.41
PERCHLOROETHYLENE	127184	0.38	1625	0.38	1625
PHENOL	108952	0.027	107	0.027	107
PROPYLENE	115071	6.9 E-5	0.37	6.9 E-5	0.37
PROPYLENE OXIDE	75569	2.1 E-4	1.0	2.1 E-4	1.0

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES. DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY IS THE INFORMATION USED IN THE HRA.

REVIEWING ENGINEER _____

HRA 89 FORM 1

FACILITY EMISSIONS SUMMARY FORM

EMISSIONS REPORTED IN AN ATIR COMPARED WITH
EMISSIONS USED IN THE HRA

COMPANY NAME ROHR INDUSTRIES, INC.- RIVERSIDE

AQMD ID# 800113

APPENDIX A-I SUBSTANCES		EMISSIONS REPORTED IN ATIR		EMISSIONS USED IN HRA	
AIR TOXIC NAME	CAS NO.	MAXIMUM LBS/HR	AVERAGE LBS/YR	MAXIMUM LBS/HR	AVERAGE LBS/YR
CADMIUM	7440439	3.13 E-5	0.075	3.13 E-5	0.075
SODIUM HYDROXIDE	1310732	0.33	1947	0.33	1947
TOLUENE	10883	1.93	8738	1.93	8738
XYLENE	1210	2.22	8786	2.22	8786
ZINC	7440666	2.2 E-5	0.05	2.2 E-5	0.05

SEVERAL FACILITIES HAVE AMMENDED THEIR EMISSIONS DATA AFTER SUBMITTING INVENTORIES.
DATA ON THIS FORM WILL BE USED TO VERIFY WHETHER THE INFORMATION SUBMITED WITH THE INVENTORY
IS THE INFORMATION USED IN THE HRA.

REVIEWING ENGINEER _____

HRA 89 FORM 1

SOURCE AND STACK PARAMETERS

COMPANY NAME ROHR INDUSTRIES, INC. | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
BUILDING # 1							
90101	70101	90101	456959, 3,756,435	34	3	70	29518
90102	70101	90102	456965, 3,756,435	34	3	70	29518
90103	70101	90103	456970, 3,756,435	34	3	70	29518
90104	70101	90104	456975, 3,756,435	34	3	70	29518
90105	70102	90105	457460, 3,756,018	32	4	70	22005
90106	70102	90106	457465, 3,756,018	32	4	70	22005
90107	70102	90107	457470, 3,756,018	32	4	70	22005
90108	70102	90108	457460, 3,756,000	32	4	70	22005
90109	70102	90109	457465, 3,756,000	32	4	70	22005
90110	70102	90110	457470, 3,756,000	32	4	70	22005

SOURCE AND STACK PARAMETERS

COMPANY NAME ROHR INDUSTRIES, Inc. | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
90111	70103	90111	457425, 3,756,000	40	3	70	21598
90112	70103	90112	457425, 3,756,990	40	3	70	21598
90113	70104	90113	457298, 3,756,025	35	1	200	587
90114	70105	90114	457298, 3,756,018	35	2	240	1244
90115	70106	90115	457350, 3,756,072	20	3	300	57382
90116	70107	90116	457318, 3,756,070	15	3	300	70278
F101	70108	70101	457170, 3,755,980	31	3	70	139
F102	70109	70102	457225, 3,755,980	31	3	70	139
F103	70110	70103	457200, 3,755,980	31	3	70	139
F104	70111	70104	456959, 3,756,440	34	3	70	139
F105	70112	70105	457104, 3,755,980	31	3	70	139

SOURCE AND STACK PARAMETERS

COMPANY NAME: ROHR INDUSTRIES, INC | AQMD ID#: 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
F106	70113	70106	457058, 3,756,228	31	3	70	139
F113	70120	70113	457305, 3,755,995	31	3	70	139
F114	70121	70114	457482, 3,756,983	31	3	70	139
F115	70122	70115	457298, 3,756,983	31	3	70	139
F116	70123	70116	457443, 3756995	31	3	70	139
BLD#3 F301	70301	70301	457484, 3,755,998	31	3	70	139
F302	70302	70302	457428, 3,755,867	31	3	70	139
F303	70303	70303	457430, 3,755,860	31	3	70	139
F304	70304	70304	457375, 3,755	31	3	70	139
F305	70305	70305	457430, 3,755,900	31	3	70	139
F306	70306	70306	457375, 3,755,856	31	3	70	139

SOURCE AND STACK PARAMETERS

COMPANY NAME	Rohr Industries, Inc.	AQMD ID#	800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
F307	70307	70307	457402, 3,755,885	31	3	70	139
F308	70308	70308	457420, 3,755,885	31	3	70	139
90401 (BLD#4)	70401	90401	457315, 3,755930	15	3	300	70278
90402	70402	90402	457300, 3,755,930	15	3	300	70278
90403	70403	90403	457300, 3,755930	31	3	300	57382
90404	70404	90404	457350, 3,755915	35	3	300	2026
90405	70405	90405	457350, 3,755,946	35	3	300	2026
90406	70406	90406	457107, 3,755,925	35	2	400	1019
90407	70407	90407	457107, 3,755,923	35	2	400	1019
90408	70408	90408	457323, 3,755,928	25	1	400	1019
90409	70409	90409	457323, 3,755,930	25	1	250	1577

SOURCE AND STACK PARAMETERS

COMPANY NAME Rohr Industries Inc. | AQMD ID# 800117

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
90410	70410	90410	457158, 3,755,941	35	2	70	4710
90411	70411	90411	457178, 3,755,922	30	0.83	250	507
90412	70412	90412	457000, 3,756,138	30	0.67	150	81
90413	70413	90413	457252, 3,756,913	30	2	240	2074
90414	70414	90414	457235, 3,756,923	30	0.67	250	236
90415	70415	90415	457235, 3,756,923	42	4	70	18840
90416	70416	90416	457235, 3,755,878	35	4	70	17936
90417	70416	90417	457242, 3,755,878	35	4	70	17936
90418	70417	90417	457250, 3,755,830	38	4	70	11304
90419	70417	90417	457260, 3,755,830	38	4	70	20096
90420	70417	90417	457255, 3,755,830	38	4	70	11304

SOURCE AND STACK PARAMETERS

COMPANY NAME: ROHR INDUSTRIES, INC.

AQMD ID#: 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
90421	70418	90421	457235, 3,755,900	35	4	70	17936
90422	70418	90422	457243, 3,755,900	35	4	70	17936
90423	70419	90423	457235, 3,755,912	42	3	70	10598
90424	70420	90424	457188, 3,755,892	32	2	70	3140
90436	70432	90436	457275, 3,755902	32	2	70	942
90437	70432	90437	457275, 3,755904	32	2	70	942
F401	70433	70401	457170, 3,755,900	4	area source N/A	N/A	N/A
F402	70434	70402	457155, 3,755,950	31	3	70	139
F403	70435	70403	457248, 3,755978	31	3	70	139
F404	70436	70404	457271, 3,755,960	31	3	70	139
F405	70437	70405	457271, 3,755,950	31	3	70	139

SOURCE AND STACK PARAMETERS

COMPANY NAME ROHR INDUSTRIES, INC | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
F406	70438	70406	457271, 3,755,940	31	3	70	139
F407	70439	70407	457271, 3,755,952	31	3	70	139
F408	70440	70408	457271, 3,755,935	31	3	70	139
F409	70441	70409	457271, 3,755,930	31	3	70	139.
F410	70442	70410	457323, 3,755,938	31	3	70	139
90438	70443	90438	457165, 3,755,890	20	1.75	70	1772
90441	70446	90441	457270, 3,755,885	35	1.75	250	1772
90501 BLD	70501	90501	457505, 3,756,098	25	1	70	707
90502	70502	90502	457062, 3,756,095	25	1	70	707
90503	70503	90503	457061, 3,756,100	25	1	70	707
90503	70504	90504	457095, 3,756,100	25	1	70	942

SOURCE AND STACK PARAMETERS

COMPANY NAME	Rohr Industries, Inc.	AQMD ID#	800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG F	Gas Flow Rate (ACFM)
90505	70505	90505	457080, 3,756,100	25	0.67	70	617
90506	70506	90506	457080, 3,756,095	25	1.5	70	707
90507	70507	90507	457075, 3,756,130	20	1.67	70	5473
90508	70508	90508	457065, 3,756,130	20	0.33	350	26
90509	70509	90509	457072, 3,756130	21	0.25	150	10
F501	70510	70501	457025, 3,756,108	21	3	70	139
F502	70511	70502.	457090, 3,756,090	21	3	70	139
90510	70512	90510	457093, 3,756,095	25	0.33	70	25
90511	70513	90511	457060, 3,756,130	25	1	150	942
BLD 14 91401	71401	91401	457427, 3,755,950	30	3	70	18016
91402	71402	91402	457425, 3,755,943	30	3	70	15896

SOURCE AND STACK PARAMETERS

COMPANY NAME Rohr Industries, Inc. | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
91403	71402	91403	457410, 3,755,960	30	3	70	16956
91404	71403	91404	457405, 3,755,080	30	3	70	16956
91405	71403	91405	457327, 3,755,063	30	3	70	16956
91406	71403	91406	457404, 3,755980	30	3	70	16956
91407	71403	91407	457411, 3,755,980	30	3	70	16956
91409	71405	91409	457350, 3,755,937	30	0.67	150	.81
F1401	71407	71401	457395, 3,755,982	16	3	70	139
F1402	71408	71402	457398, 3,755950	16	3	70	139
BLD 15 F1501	71501	71501	457485, 3755958	11	3	70	139
F1502	71502	71502	457485, 3,755,900	11	3	70	139
BLD 16 F1602	71602	71602	457267, 3,756,056	21	3	70,	139

SOURCE AND STACK PARAMETERS

COMPANY NAME: Rohr Industries, Inc.

AQMD ID#: 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
BLD 19 F1901	71901	71901	457055, 3,755,992	21	3	70	
BLD 20 92001	72001	92001	457020, 3,756,136	25	1.67	70	1363
F2001	72002	72001	457020, 3,756,130	21	3	70	139
BLD 24 92401	72401	92401	457445, 3,755,080	25	3	70	18736
F2402	72402	72402	457390, 3,756,080	21	3	70	139
BLD 27 92701	72701	92701	457330, 3,755,890	30	3	300	1520
92702	72702	92702	457335, 3,755,890	30	5	300	4221
92703	72703	92703	457332, 3,755,877	35	2	400	1019
BLD 29 92901	72901	92901	457325, 3,755,890	30	3	106	11197
BLD 31 93101	73101	93101	457250, 3,755,858	25	1	150	226
93102	73102	93102	457175, 3,755,835	25	1.67	350	502

SOURCE AND STACK PARAMETERS

COMPANY NAME Rohr Industries, Inc. | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
BLD 32 F3201	73201	73201	457060, 3,755,905	21	13	70	139
BLD 41 94101	74101	94101	456935, 3,756105	35	1.5	70	3533
94102	74101	94102	456935, 3,756,097	35	1.5	70	3533
94103	74101	94103	456930, 3,756,070	35	1.5	70	3533
94104	74101	94104	456930 3,756,060	35	1.5	70	3533
94105	74102	94105	456968 3,756,060	35	1.5	70	3533
94106	74102	94106	456970, 3,756,060	35	1.5	70	3533
94107	74103	94107	456930, 3,756,070	32	1.5	70	3533
94108	74103	94108	456930, 3,756,065	32	1.5	70	3533
94109	74103	94109	456930, 3,756,060	32	1.5	70	3533
94110	74103	94110	456935 3,756,055	32	1.5	70	3533

SOURCE AND STACK PARAMETERS

COMPANY NAME	Rohr Industries, Inc.	AQMD ID#	800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
94111	74104	94111	457050, 3,756,060	32	3	70	35325
94112	74105	94112	457050, 3,755,990	32	3	70	35325
94113	74106	94113	456939, 3,755,998	35	3	70	35325
94114	74107	94114	456970, 3,756060	10	3	300	57382
F4101	74111	74101	456970, 3,756,025	31	3	70	139
94118	74112	94118	456978, 3,755,978	25	1	250	421
BLD 53 F5301	75301	75301	457365, 3,755,788	16	3	70	139
95302	75302	95302	457065, 3,755,788	30	3	300	18236
95303	75302	95303	457070, 3,755,788	30	3	300	18236
BLD 55 95501	75501	95501	457010, 3,755,990	35	3	300	3039
95502	75502	9550	457021, 3,755,978	35	3	300	3039

SOURCE AND STACK PARAMETERS

COMPANY NAME Pohr Industries Inc | AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
BLD 58 F5801	75801	95901	456972, 3,755,960	4	3	150	100
F5802	75802	95802	456970, 3,755,950	4	3	150	100
BLD 59 95901	75901	95901	457585, 3,755,962	35	4	70	13690
F5901	75902	75901	457580, 3,755962	26	3	70	1546
F5902	75903	75902	457585, 3,755,955	26	3	70	1546
F9901	79901	79901	457060, 3,755,835	10	area source N/A	N/A	N/A
F9902	79902	79902	457541, 3,756013	3	area source N/A	N/A	N/A
COOLING TOWERS F9903	79903	79903	457305, 3,755,901	15	area N/A	source N/A	N/A
F9904	79904	79904	457305 3,755,887	15	area N/A	source N/A	N/A
F9905	79905	79905	457301 3,755,880	15	area N/A	source N/A	N/A
F99016	799016	799016	457090, 3,755,702	15	area N/A	source N/A.	N/A

SOURCE AND STACK PARAMETERS

COMPANY NAME Rohr Industries, Inc

AQMD ID# 800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
F9907	79907	79907	457298, 3,755,916	15	area N/A	source N/A	N/A
F9908	79908	79908	457312, 3,755907	15	area N/A	source N/A	N/A
F9909	79909	79909	457325, 3,755910	15	area N/A	source N/A	N/A
F9910	79910	79910	457322, 3,756,083	15	area N/A	source N/A	N/A
F9911	79911	79911	457323 3,756,087	15	area N/A	source N/A	N/A
F9912	79912	79912	457974, 3,756,081	15	area N/A	source N/A	N/A
F9913	79913	79913	457065, 3,756,100	15	area N/A	source N/A	N/A
F9914	79914	79914	457600, 3,756,080	15	area N/A	source N/A	N/A
F9915	79915	79915	457113, 3,756,105	15	area N/A	source N/A	N/A
F9916	79916	79916	457118, 3,756,097	15	area N/A	source N/A	N/A
F9917	79917	79917	457347, 3,755,927	15	area N/A	source N/A	N/A

SOURCE AND STACK PARAMETERS

COMPANY NAME	Rohr Industries, Inc.	AQMD ID#	800113

Process/Device Information				Stack Parameters			
Emission Point ID #	Device ID #	Dispersion Model ID #	Modeling Location	Height (ft)	Diameter (ft)	Gas Temp. DEG. F	Gas Flow Rate (ACFM)
F9918	79918	79918	457004, 3,756,000	15	area N/A	source N/A	N/A
F9919	79919	79919	457021, 3,755,985	15	area	source N/A	N/A
F9920	79920	79920	457005, 3,755,985	15	area N/A	source N/A	N/A
F9921	79921	79921	457033, 3,756,000	15	area N/A	source N/A	N/A
F9922	79922	79922	456969, 3,755,958	15	area N/A	source N/A	N/A
F9923	79923	79923	457242, 3,755,858	15	area N/A	source N/A	N/A
F9924	79924	79924	457365, 3,755,838	15	area N/A	source N/A	N/A
F9925	79925	79925	457020, 3756,146	15	area N/A	source N/A	N/A

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
SPRAY BOOTH G-2	90101-04	70101	D05087	XYLENE	1210	.04792	230
				TOLUENE	108883	.2092	974
				PHENOL	108952	.00021	1
				NAPHTHALENE	91203	.00021	1
				METHYLENE CHLORIDE	75092	7.29E-5	.35
				LEAD COMPOUNDS	1130	2.29E-5	.11
				ISOCYNATES	1125	.001	4.8
				GLYCOL ETHERS	1115	.00733	35.2
				FORMALDEHYDE	50000	.00021	1
				1,3 BUTADIENE	106990	7.7E-5	.37
				ACRYLONITRILE	107131	7.6E-5	.366
				1,1,1 TCA	71556	.1054	506

REVIEW ENGINEER _____

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
G-2 CONT'D				1,4 DIOXANE	123911	.00269	12.9
SPRAY BOOTH G-1	90105-10	70102	D13145	XYLENE	1210	.061	293
				TOLUENE	108883	.019	93
				ISOCYANATES	1125	.078	373
				GLYCOL ETHER	1115	.022	107
				1,1,1 TCA	71556	.031	15
SPRAY BOOTH G-10	90111-12	70103	D05096	XYLENE	1210	.039	190
				TOLUENE	108883	.032	155
				ISOCYANATES	1125	.012	57
				1,4 DIOXANE	123911	.0001	.5
GAS OVEN C-7	90113	70104	N53526	BENZENE	71432	2.1E-5	.1
				FORMALDEHYDE	108883	4.2E-5	.2

REVIEW ENGINEER _____

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
C-7 CONT'D				TOLUENE	108883	2.1 E-5	.1
GAS OVEN C-8	90114	70105	01198R	BENZENE	71432	2.1 E-5	.1
				FORMALDEHYDE	50000	2.1 E-5	.1
				TOLUENE	108883	8.3E-6	.04
GAS AUTOCLAVE #8	90115	70106	A/N 192917	BENZENE	71432	.00019	.9
				FORMALDEHYDE	50000	.00042	2
				TOLUENE	108883	8.3E-5	.4
GAS AUTOCLAVE #9	90116	70107	A/N 192918	BENZENE	71432	.00031	1.5
				FORMALDEHYDE	50000	8.3E-5	.4
				TOLUENE	108883	.00017	.8
COMPOSITE SHOP	F101	70108	N/A	FORMALDEHYDE	50000	2.1E-6	.01
				METHYLENE CHLORIDE	75092	.0014	6.75

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AQMD ID# 800113

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SHOP CONT'D				PERCHLORO-ETHYLENE	127184	4.2E-5	.2
				FLUOROCARBONS	1105	.00142	6.8
				XYLENE	1210	.00021	1
FILAMENT WINDING AREA	F102	70109	N/A	FORMALDEHYDE	50000	4.2E-6	.02
				METHYLENE CHLORIDE	75092	.00141	6.75
				PERCHLORO-ETHYLENE	127184	4.2E-5	.2
				FLUOROCARBONS	1105	.00188	9
				XYLENE	1210	.00021	1
MD 80 FIRST STAGE AREA	F103	70110	N/A	METHYLENE CHLORIDE	75092	.00141	6.75
				PERCHLORO-ETHYLENE	127184	4.2E-5	.2
				FLUOROCARBONS	1105	.00188	9
				XYLENE	1210	.00021	1

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BIG PAINT SHOP	F104	70111	N/A	1,1,1 TCA	71556	.0271	136
				HYDROCARBONS	1105	.827	3971
				METHYLENE CHLORIDE	75092	.0575	276
				NAPHTHALENE	91203	.0195	39
				PHENOL	108952	.0163	78
				PROPYLENE OXIDE	75569	.00021	1
				TOLUENE	108883	.4325	2076
				XYLENE	1210	.01604	77
GERBER CUTS KIT AREA	F105	70112	N/A	XYLENE	1210	.0018	9
JT 8D-90 DKT AREA	F106	70113	N/A	XYLENE	1210	.0281	135
				HYDROCARBONS	1105	.0844	405

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F-14 ASSEMBLY AREA	F107	70114	N/A	FLUOROCARBONS	1105	.0925	444
				METHYLENE CHLORIDE	75092	.026	125
				TOLUENE	108883	.00104	5
				XYLENE	1210	.1775	852
F-14 DUCT WALL AREA	F108	70115	N/A	FLUOROCARBONS	1105	.09229	443
				METHYLENE CHLORIDE	75092	.02604	125
				TOLUENE	108883	.00104	5
F-14 INLET AREA	F109	70116	N/A	FLUOROCARBONS	1105	.09229	443
				METHYLENE CHLORIDE	75092	.02604	125
				TOLUENE	108883	.00104	5
F-14 SIDE WALL	F110	70117	N/A	FLUOROCARBONS	1105	.09229	443
				METHYLENE CHLORIDE	75092	.02604	125

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SIDE WALL CONT'D				TOLUENE	108883	.00104	5
ANNEX TOOL REWORK AREA	F111	70118	N/A	TOLUENE	108883	.0833	40
TOOLING LAYOUT	F112	70119	N/A	TOLUENE	108883	.0833	40
TOOLING CONTROL LINE	F113	70120	N/A	1,1,1 TCA	71556	.3833	1840
SHIPPING INCOMING	F114	70121	N/A	1,1,1 TCA	71556	.00083	4
				TOLUENE	108883	.00042	2
				XYLENE	1210	.00021	1
SMALL WELD SHOP	F115	70122	N/A	NICKEL	7440020	.00017	.405
				MANGANESE	7439965	5E-5	.121
				COPPER	7440506	.00015	.353
				ZINC	7440666	2.2E-5	.053
				CADMIUM	7440439	3.13E-5	.075

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ALODINE WASH RACK	F116	70123	N/A	HEX. CHROME	18540299	2.22 E-7	.0004
GAS OVEN C-6	90117	70124	E03150	BENZENE	71432	0	0
				FORMALDEHYDE	50000	0	0
				TOLUENE	108883	0	0
WAREHOUSE PARTS SHOP	F301	70301	N/A	TOLUENE	108883	.00313	15
CONVEYOR SUB ASSEMBLY	F302	70302	N/A	TOLUENE	108883	.00021	1
DRIVEMATICS	F303	70303	N/A	TOLUENE	108883	.00021	1
POST BOND ROUT	F304	70304	N/A	1,1,1 TCA	71556	.00052	2.5
				TOLUENE	108883	.06917	332
				XYLENE	1210	.00039	.233
ACCESS COWL	F305	70305	N/A	FLUOROCARBONS	1105	.08438	405
				XYLENE	1210	.02654	137

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ACCESS CIVIL CONT'D				TOLUENE	108883	.00021	1
INSPECTION A-FRAME	F306	70306	N/A	1,1,1 TCA	71556	.00667	32
				METHANOL	67561	.00625	30
				TOLUENE	108883	.00023	1.1
				FLUOROCARBONS	1105	.0036	17.2
				XYLENE	1210	.148	710
MAINTENANCE WELD SHOP	F307	70307	N/A	COPPER	7440506	.00039	.233
				MANGANESE	7439965	.00039	.233
MAINTENANCE MACHINE SHOP	F308	70308	N/A	1,1,1 TCA	71556	.2416	1159
				FLUOROCARBON	1105	.0033	6.6
GAS AUTOCLAVE #4	90401	70401	A/N 192915	BENZENE	71432	8E-5	.6
				FORMALDEHYDE	50000	.00018	1.3

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AUTOCLAVE #4 CONT'D				TOLUENE	108883	4.2E-5	.3
GAS AUTOCLAVE # 5	90402	70402	A/N 192916	BENZENE	71432	.00014	1
				FORMALDEHYDE	50000	.00032	2.3
				TOLUENE	108883	6.9E-5	.5
GAS AUTOCLAVE # 2	90403	70403	A/N 192914	BENZENE	71432	.0014	1
				FORMALDEHYDE	50000	.00032	2.3
				TOLUENE	108883	6.9E-5	.5
GAS ISORAD BOILER #1	90404	70404	02748R	BENZENE	71432	.00028	2.05
				FORMALDEHYDE	50000	.00064	4.6
				TOLUENE	108883	.0014	1
GAS ISORAD BOILER #2	90405	70405	02748R	BENZENE	71432	.00028	2.05
				FORMALDEHYDE	50000	.00064	4.6

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ISORAD BOILER #2 CONT'D				TOLUENE	108883	.00014	1
GAS CLAYTON BOILER 1	90406	70406	E02974	BENZENE	71432	.00011	.8
				FORMALDEHYDE	50000	.00026	1.9
				TOLUENE	108883	5.5 E-5	.4
GAS CLAYTON BOILER 2	90407	70407	E03126	BENZENE	71432	.00013	.3
				FORMALDEHYDE	50000	.00025	.6
				TOLUENE	108883	4.2 E-5	.1
GAS OVEN C-27	90408	70408	00477R	BENZENE	71432	4.2 E-5	.3
				FORMALDEHYDE	50000	8.3 E-5	.6
				TOLUENE	108883	1.4 E-5	.1
GAS OVEN C-14	90409	70409	M33327	BENZENE	71432	1.5 E-5	.0355
				FORMALDEHYDE	50000	4.2 E-5	.1

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OVEN C-14 CONT'D				TOLUENE	108883	7.5E-6	.0179
DYNAROMIC FLC HOOD	90410	70410	N/A	1,1,1 TCA	71556	1.99	9568
				HYDROGEN FLUORIDE	7664393	1.244E-6	0.0104
GAS OVEN C-3	90411	70411	01164R	BENZENE	71432	1.4E-5	.1
				FORMALDEHYDE	50000	2.8E-5	.2
				TOLUENE	108883	6.8E-6	.049
GAS OVEN C-11	90412	70412	N/A	BENZENE	71432	2.8E-5	.2
				FORMALDEHYDE	50000	5.5E-5	.4
				TOLUENE	108883	1.4E-5	.1
GAS OVEN C-1	90413	70413	01093R	BENZENE	71432	2.8E-5	.2
				FORMALDEHYDE	50000	5.5E-5	.4
				TOLUENE	108883	1.4E-5	.1

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GAS OVEN C-2	90414	70414	01084 R	BENZENE	71432	2.8E-5	.2
				FORMALDEHYDE	50000	5.5E-5	.4
				TOLUENE	108883	1.4E-5	.1
SPRAY BOOTH G-12	90415	70415	D0519 7	XYLENE	1210	.0011	7.93
				TOLUENE	108883	.00139	10.02
				METHANOL	67561	.0022	15.7
				GLYCOL ETHER	1115	.181	1301
SPRAY BOOTH G-14	90416-17	70416	D05214	XYLENE	1210	.00013	.961
				TOLUENE	108883	.00017	1.21
				METHYLENE CHLORIDE	75092	.0028	19.91
				METHANOL	67561	.0015	10.87
				GLYCOL ETHER	1115	.114	820

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BOOTH G-14 CONT'D				ETHYLENE DICHLORIDE	107062	.00065	4.69
				1,4 DIOXANE	123911	.000415	2.99
				1,1,1 TCA	71556	.00025	1.81
SPRAY BOOTH G-20	90418-20	72417	D05093	XYLENE	1210	8.3E-6	.06
				TOLUENE	108883	.000351	2.53
				GLYCOL ETHER	1115	.375	2703
				1,4 DIOXANE	123911	8.3E-6	.06
				1,1,1 TCA	71556	.000358	2.58
SPRAY BOOTH G-13	90421-22	70418	D05091	XYLENE	1210	.00078	5.63
				TOLUENE	108883	.00445	32.07
				METHYLENE CHLORIDE	75092	.126	907.1
				METHANOL	67561	5.5E-5	.395

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BOOTH G-13 CONT'D				GLYCOL ETHER	111 5	.0523	376.67
				ETHYLENE DICHLORIDE	107062	.1041	749.18
				1,4 DIOXANE	123911	.0189	136.3
SPRAY BOOTH G-11	90423	70419	D05090	XYLENE	1210	8.5E-5	.619
				TOLUENE	108883	.0032	23.72
				PHENOL	108952	.0003	2.74
				METHANOL	67561	.00043	3.1
				GLYCOL ETHER	115	.349	2517
				FORMALDEHYDE	50000	.00038	2.74
				1,1,1 TCA	71556	9.7E-5	.705
CORE DIP TANKS	90424	70420	N/A	TOLUENE	108883	.004	28.8
				ETHYLENE DICHLORIDE	107062	.0579	417

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PROCESS DIP TANK A-3	90425	70421	A/N 201162	HEX. CHROME	18540299	.000208	1.75
PROCESS DIP TANK E-12	90426	70422	A/N 201162	SODIUM HYDROXIDE	1310732	0	0
PROCESS DIP TANK F-1	90427	70423	A/N 201162	HEX. CHROME	18540299	.000435	3.65
PROCESS DIP TANK E-1	90428	70424	A/N 201162	HEX. CHROME	18540299	.00003	.055
PROCESS DIP TANK E-5	90429	70425	A/N 201162	HEX. CHROME	18540299	.00016	1.35
				HYDROGEN FLUORIDE	7664393	0.00226	18.98
PROCESS DIP TANK H-2	90430	70426	A/N 201162	HEX. CHROME	18540299	.00015	1.25
PROCESS DIP TANK H-1	90431	70427	A/N 201162	HYDROGEN FLUORIDE	7664393	0.002456	20.63
PROCESS DIP TANK E-9	90432	70428	A/N 201162	HEX. CHROME	18540299	.00003	.21
PROCESS DIP TANK D-3	90433	70429	A/N 201162	HEX. CHROME	18540299	.000208	1.75
PROCESS DIP TANK E-13	90434	70430	A/N 201162	HEX. CHROME	18540299	0	0
PROCESS DIP TANK F-3	90435	70431	A/N 201162	HEX. CHROME	18540299	.000433	2.71

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POTTING/LAYUP AREA	90436-37	70432	N/A	XYLENE	1210	.038	185.45
VAPOR DEGREASER	F401	70433	02487R	1,1,1 TCA	71556	3.58	17172
DYNAROLL WOVEN AREA	F402	70434	N/A	XYLENE	1210	.0021	10.54
METAL BOND SHOP	F403	70435	N/A	1,1,1 TCA	71556	.072	345.87
				FLUOROCARBONS	1105	1.57	7496
				METHANOL	67561	1.8E-5	.09
				METHYLENE CHLORIDE	75092	1.22	5839
				PERCHLORO-ETHYLENE	127184	.0356	171.2
				TOLUENE	108883	.00013	.65
				XYLENE	1210	.161	774.14
ADHESIVE BOND CURE AREA	F404	70436	N/A	1,1,1 TCA	71556	1.99	9587
				HYDROGEN FLUORIDE	7664393	1.24E-6	0.0104

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CURE AREA CONT'D				METHYLENE CHLORIDE	75092	.3057	1467
				NAPHTHALENE	91203	.00124	5.96
				PERCHLORO-ETHYLENE	127184	.0099	42.8
				SODIUM HYDROXIDE	1310732	.0577	277.27
				TOLUENE	108883	.018	87
				FLUOROCARBON	1105	.354	1844.9
				XYLENE	1210	.0356	185.45
ADHESIVE BOND LAMP AREA	F405	70437	N/A	1,1,1 TCA	71556	1.99	9587
				HYDROGEN FLUORIDE	7664393	124E-6	0.0104
				METHYLENE CHLORIDE	75092	.3057	1467
				NAPHTHALENE	91203	.00124	5.96
				PERCHLORO-ETHYLENE	127184	.0099	42.8

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LAYUP AREA CONT'D				SODIUM HYDROXIDE	1310732	.0577	277.27
				TOLUENE	108883	.018	87
				FLUOROCARBONS	1105	.354	1844.9
				XYLENE	1210	.0386	185.45
ADHESIVE BOND PREFIT AREA	F406	70435	N/A	1,1,1 TCA	71556	1.99	9587
				HYDROGEN FLUORIDE	7664393	1.24E-6	0.0104
				METHYLENE CHLORIDE	75092	.184	893.7
				NAPHTHALENE	91203	.00124	5.96
				PERCHLORO-ETHYLENE	127184	.00535	25.68
				SODIUM HYDROXIDE	1310732	.0577	277.27
				TOLUENE	108883	.00013	.66
				FLUOROCARBONS	1105	.23	1107

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PREFIT AREA (CONT'D				XYLENE	1210	.023	111.27
DEBAG CLEAN ROOM AREA	F407	70439	N/A	1,1,1 TCA	71556	1.99	9567.9
				HYDROGEN FLUORIDE	7664393	1.24E-6	0.0104
				METHYLENE CHLORIDE	75092	.0016	7.87
HYDRAULIC PRESS CELL AREA	F408	70440	N/A	1,1,1 TCA	71556	1.99	9567.9
				HYDROGEN FLUORIDE	7664393	1.24E-6	0.0104
				METHYLENE CHLORIDE	75092	.0016	7.87
SPRAY BAKE/BOND ASSY	F409	70441	N/A	1,1,1 TCA	71556	1.99	9567
				FLUORINATED BONS	1105	.0132	65.5
				HYDROGEN FLUORIDE	7664393	1.24E-6	0.0104
				METHYLENE FLUORIDE	75092	.0122	58.96
				NAPHTHALENE	91203	.002	11.91

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BAKE/BOND ASS'Y CONT'D				PERCHLORO-ETHYLENE	127184	.0003	1.5
				SODIUM HYDROXIDE	1310732	.0577	277.27
				TOLUENE	108883	.0005	2.4
				XYLENE	1210	.00135	6.49
TITAN MFG. AREA	F410	70442	N/A	METHANOL	67651	1.8E-5	.09
				PROPYLENE	75569	1.25E-5	.06
VAPOR DEGREASER GAS HEATER	90438	70443	E03676	BENZENE	71432	.0005	.1
				FORMALDEHYDE	50000	0	0
				TOLUENE	108883	0	0
PROCESS DIP TANK E-15	90439	70444	A/N 201162	HEX. CHROME	18540299	.0004	3.8
PROCESS DIP TANK H-15	90440	70445	A/N 201162	HEX. CHROME	18540299	.0004	3.8
GAS OVEN C-4	90441	70446	01165R	BENZENE	71432	1.3E-5	.1

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PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

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Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
BUEN C-4 CONT'D				FORMALDEHYDE	50000	2.0E-5	.2
				TOLUENE	108883	5.5E-6	.04
WET RESIN APPL. AREA	90501	70501	N/A	XYLENE	1210	.0038	18.61
				PERCHLORO-ETHYLENE	127184	.0005	1
DRY LAYUP ROOM	90502	70502	N/A	FLUOROCARBONS	1105	.00555	11.1
CHEMICAL LAB HOODS	90503	70503	N/A	GLYCOL ETHER	1115	.0045	9.1
				XYLENE	1210	.004105	8.1
				CARBON TETRACHLORIDE	56235	.0066	13.3
				METHANOL	67561	.0033	6.6
				PHENOL	108952	.0044	8.8
				1,4 DIOXANE	123911	.0043	8.6
				PERCHLORO-ETHYLENE	127184	.00625	12.5

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Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
SPRAY BOOTH G-15	90507	70507	02476R	XYLENE	1210	.0005	3.6
				TOLUENE	108883	.00019	1.4
				METHANOL	67561	4.1 E-6	.03
				GLYCOL ETHER	1115	.00033	2.4
				ISOCYANATES	1125	6.5E-5	.47
GAS CURE OVEN LCR-3	90508	70508	N/A	BENZENE	71432	1.4E-6	.01
				FORMALDEHYDE	50000	3.2E-6	.02
				TOLUENE	108883	7.1 E-7	.005
GAS CURE OVEN C-15	90509	70509	N/A	BENZENE	71432	1.4 E-6	.01
				FORMALDEHYDE	50000	3.2 E-6	.02
				TOLUENE	108883	7.1 E-7	.005

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LAB HOODS CONT'D				TOLUENE	108883	.0036	7.2
ANALYTICAL LAB HOOD	90504	70504	N/A	GLYCOL ETHER	1115	.0045	9.1
				XYLENE	1210	.00405	8.1
				CARBON TETRACHLORIDE	56235	.0066	13.3
				METHANOL	67561	.0033	6.6
				PHENOL	108952	.0044	8.8
				1,4 DIOXANE	123911	.0043	8.6
				PERCHLORO-ETHYLENE	127184	.00625	12.5
				TOLUENE	108883	.0036	7.2
SMALL COLD DEGREASER	90505	70505	E04071	1,1,1 TCA	71556	.023	56
R&D PROCESS LINE	90506	70506	N/A	TOLUENE	108883	.009	43.21

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F-14 VENT AREA	F501	70510	N/A	1,1,1 TCA	71556	.0055	26.7.
				FLUOROCARBONS	1105	.0053	25.5
				FORMALDEHYDE	50000	2E-5	.09
				METHANOL	67651	.02	101
				METHYLENE CHLORIDE	75092	.008	40.25
				NAPHTHALENE	91203	.0136	65.5
				PERCHLORO-ETHYLENE	127184	5E-5	.26
				PHENOL	108952	.0008	3.8
EN TEST ENGR AREA	F502	70511	N/A	1,1,1 TCA	71556	.48	2288
				METHANOL	67651	.01	52.94
				SODIUM HYDROXIDE	1310732	.007	35.5
				TOLUENE	108883	.0036	17.6

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EN TEST ENGR CONT'D				FLUOROCARBONS	1105	.003	16.07
				METHYLENE CHLORIDE	67651	.001	7.01
METALLURGIC LAB HOOD	90510	70512	N/A	CARBON TETACHLORIDE	56235	.0066	13.2
				METHANOL	67561	.0033	6.6
				METHYLENE CHLORIDE	75092	.0022	10.8
				ETHYLENE OXIDE	75218	.0034	6.8
				TOLUENE	108883	.0036	7.3
GAS CURE OVEN KC-14	90511	70513	N/A	BENZENE	71432	1.4 E-6	.01
				FORMALDEHYDE	50000	3.2 E-6	.02
				TOLUENE	108883	7.1 E-7	.005
SPRAY BOOTH G-6	91401	71401	D05094	XYLENE	1210	.509	1222
				TOLUENE	108883	.108	259.3

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BOOTH G-6 CONT'D				ISOCYANATE	1125	.00079	1.9
				1,1,1 TCA	71556	.83	2006
				1,4 DIOXANE	123911	.01	29.2
SPRAY BOOTH G-18	91402-03	71402	D05215	XYLENE	1210	.095	227.2
				TOLUENE	108883	.03	76.3
				ISOCYANATES	1125	7.8E-5	.187
				1,1,1 TCA	71556	.26	623.4
SPRAY BOOTH G-19	91404-7	71403	D05092	XYLENE	1210	.11	524.6
				TOLUENE	108883	.02	98
				ISOCYANATES	1125	.0036	17.42
				1,1,1 TCA	71556	.244	1174

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GAS OVEN C-16	91409	71405	N/A	BENZENE	71432	2.1 E-5	.2
				FORMALDEHYDE	50000	5.5 E-5	.4
				TOLUENE	108883	1.07 E-5	.1
ADHESIVE BOND - COLD	F1401	71407	N/A	1,1,1 TCA	71556	.03	183.5
				METHYLENE CHLORIDE	75092	.0052	29.2
				NAPHTHALENE	91203	.0053	29.8
				PERCHLORO - ETHYLENE	127184	.00015	.86
				PROPYLENE	75569	4.5E-5	.25
				TOLUENE	108883	.165	922.7
				FLUORANTHENE	1105	.007	36.9
				XYLENE	1210	.011	62.9

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SMALL PAINT BOOTH	F1402	71408	N/A	1,1,1 TCA	71556	.014	75.8
				FLUOROCARBONS	1105	.0975	549
				METHYLENE CHLORIDE	75092	.018	99.5
				NAPHTHALENE	91203	.0053	29.8
				PERCHLORO-ETHYLENE	127184	1.1E-5	.06
				TOLUENE	108883	.175	980.3
				XYLENE	1210	.0053	29.75
ALODINE WASH RACK	F1403	71409	N/A	HEX. CHROME	18540299	2.3E-6	.0043
COMBS FLAME SPRAY AREA	F1501	71501	N/A	FLUORO-CARBONS	1105	.0033	9.53
				FORMALDEHYDE	50000	1.8E-6	.01
				METHYLENE CHLORIDE	75092	.0012	6.75
				PERCHLORO-ETHYLENE	127184	3.6E-5	.2

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SPRAY AREA CONT'D				XYLENE	1210	.00015	.86
COMPOS & METAL PAINT AREA	F1502	71502	N/A	1,1,1 TCA	71556	.052	293.3
				HYDROCARBONS	1105	.25	848
				METHANOL	67561	1.6 E-5	.09
				METHYLENE CHLORIDE	75092	.1	579.5
				PERCHLORO-ETHYLENE	127184	.003	16.99
				TOLUENE	108883	.00012	.66
				XYLENE	1210	.16	87.9
MODELING SHOP	F1601	71601	N/A	HYDROCARBONS	1105	.00036	2
				1,1,1 TCA	71556	.006	33.09
				NAPHTHALENE	91203	.011	59.55
				TOLUENE	108883	.016	86.94

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TOOLING PLASTIC	F1602	71602	N/A	TOLUENE	108883	.00039	217
SPRAY BOOTH 6	91601	71603	N/A	NONE	—	—	—
SPRAY BOOTH 6-25	91602	71604	E05266	NONE	—	—	—
TITAN GRAPHITE BILLET	F1901	71901	N/A	METHANOL	67561	1.6E-5	.09
THERMOPLASTIC OVEN/PRESS	92001	72001	N/A	XYLENE	1210	3.2E-7	19.2
MFG TECH R&D APCA	F2001	72002	N/A	1,1,1 TCA	71556	.45	25.75
				FLUOROCARBONS	1105	.0066	25.5
				FORMALDEHYDE	50000	1.6E-5	.09
				METHANOL	67561	.012	67.97
				METHYLENE CHLORIDE	75092	.0072	40.25
				NAPHTHALENE	91203	.011	59.55
				PERCHLORO-ETHYLENE	127184	1.6E-5	.26

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R&D AREA CONT'D				PHENOL	108952	.00069	3.81
				TOLUENE	108883	.00064	35.78
SPRAY BOOTH 6-9	92401	72401	D05095	XYLENE	1210	.00766	36.75
				TOLUENE	108883	.114	545.8
				NAPHTHALENE	91203	.0047	22.8
				ISOCYANATES	1125	.0138	18.29
				1,3 BUTADIENE	106990	.00039	1.87
				ACRYLONITRILE	107131	.00039	1.87
POLISH AREA	F2402	72402	N/A	METHYLENE CHLORIDE	75092	.23	1268.8
				NAPHTHALENE	91203	1.6	8974.6
				TOLUENE	108883	.19	1051.6

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GAS KEWANEE BOILER #1	92701	72701	027-16R	BENZENE	71432	.00029	2.1
				FORMALDEHYDE	50000	.00068	4.9
				TOLUENE	108883	.00015	1.1
GAS KEWANEE BOILER #2	92702	72702	M59197	BENZENE	71432	.000442	3.2
				FORMALDEHYDE	50000	.00102	7.3
				TOLUENE	108883	.00223	1.6
GAS TITUS BOILER	92703	72703	M59768	BENZENE	71432	0	0
				FORMALDEHYDE	50000	0	0
				TOLUENE	108883	0	0
PERC DRY CLEANER/DRYER	92901	72901	D04769, D09452	PERCHLORO-ETHYLENE	127184	.3006	1296
GAS COPIER BOILER	93101	73101	N/A	BENZENE	71432	4.5E-6	.027
				FORMALDEHYDE	50000	1.04E-5	.1

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GAS COPPER BOILER CONT'D				TOLUENE	108883	2.3E-6	.014
GAS OVEN C-31	93102	73102	N/A	BENZENE	71432	2.1 E-5	.2
				FORMALDEHYDE	50000	4.9 E-5	.4
				TOLUENE	108883	1.1E-5	.1
CHEMICAL STORES AREA	F3201	73201	N/A	FORMALDEHYDE	50000	4.8 E-6	.01
				METHANOL	67561	.0022	12.48
				TOLUENE	108883	.07	391.8
				1,1,1 TCA	71556	.0014	7.8
				XYLENE	1210	.0042	23.5
TITAN CUT/LAYUP AREA #1	94101-04	74101	N/A	1,1,1 TCA	71556	2.1	11634
TITAN CUT/LAYUP AREA #2	94105-06	74102	N/A	METHANOL	67561	.00077	4.32

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TITAN CUT/LAYUP AREA #3	94107-10	74103	N/A	TOLUENE	108883	.015	84.27
				XYLENE	1210	.015	84.30
SPRAY BOOTH G-74 TITAN	94111	74104	D32636	TOLUENE	108883	.0026	12.69
				XYLENE	1210	.066	317.37
SPRAY BOOTH G-75 TITAN	94112	74105	D32617	TOLUENE	108883	.0016	7.86
				XYLENE	1210	.041	196.56
DEGREASING SPRAY BOOTH S-4	94113	74106	D11171	1,1,1 TCA	71556	8.25	132
GAS TITAN AUTOCLAVE #10	94114	74107	A/N 192919	BENZENE	71432	.000138	.8
				FORMALDEHYDE	50000	.000138	1.9
				TOLUENE	108883	7E-5	.4
TITAN NOSE CONE EXTENSION	F4101	74111	N/A	METHANOL	67561	9.6E-5	.54
				PROPYLENE	75569	1.1E-5	.06

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GAS CLAYTON BOILER #3	94118	74112	D06041	BENZENE	71432	3.6 E-5	.1053
				FORMALDEHYDE	50000	8.3 E-5	.25
				TOLUENE	108883	1.8 E-5	.055
COGENERATION PLANT MAINT.	95301-02	75301	M59785	1,1,1 TCA	71556	.01	55.79
				FLUOROCARBONS	1105	.00021	2.1
				BENZENE	71432	.00418	25.1
				FORMALDEHYDE	50000	.00965	57.9
				TOLUENE	108883	.00211	12.7
GAS BRYAN FIXTURE BOILER 2	95301	75501	N/A	BENZENE	71432	8.44 E-5	.5
				FORMALDEHYDE	50000	.000195	1.2
				TOLUENE	108883	4.27 E-5	.3

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GAS BRYAN FLXTUBE BOILER 2	95302	75502	N/A	BENZENE	71432	8.44E-5	.25
				FORMALDEHYDE	50000	.000195	.6
				TOLUENE	108883	4.27E-5	.1
GAS RAYPACK BOILER #1	F5301	75501	N/A	BENZENE	71432	8.44E-5	.3
				FORMALDEHYDE	50000	.000195	.6
				TOLUENE	108883	4.27E-5	.1
GAS RAYPACK BOILER #2	F5902	75902	N/A	BENZENE	71432	8.44E-5	.3
				FORMALDEHYDE	50000	.000195	.6
				TOLUENE	108883	4.27E-5	.1
SPRAY BOOTH 6-8	95901	75901	02456 R	XYLENE	1210	.00139	3.3
				TOLUENE	108883	.0004	.964
				ISOCYANATES	1125	.0003	.612

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BOOTH G-3 CONT'D				GLYCOL ETHER	1125	.0087	21.02
				1,1,1 TCA	71556	.024	58.18
MAINTENANCE DEPT	F5901	75902	N/A	1,1,1 TCA	71556	1.56	8725
				FLUOROCARBONS	1105	.00056	3.12
HELIARC WELD SHOP	F5902	75903	N/A	MANGANESE	7439965	.00003125	.075
GAS OVEN EC-1	96701	76701	E02984	BENZENE	71432	2.11 E-5	.2
				FORMALDEHYDE	50000	4.9 E-5	.4
				TOLUENE	108883	1.1 E-5	.1
EDGEMONT NOSE CONE MAJOR ASSEMBLY	F6701	76702	N/A	1,1,1 TCA	71556	.0039	21.36
				FLUOROCARBONS	1105	.00026	1.414
GAS OVEN C-9	98701	78701	M33325	BENZENE	71432	1.62 E-5	.1
				FORMALDEHYDE	50000	3.73 E-5	.3

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OVEN C-9 CONT'D				TOLUENE	108883	8.2E-6	.1
SPRAY BOOTH G-24	98702	78702	E052065	XYLENE	1210	.00625	29.98
				TOLUENE	108883	.0067	31.95
				ISOCYANATES	1125	.000658	3.16
				1,1,1 TCA	71556	.0009	4.31
ARLINGTON NOSE COWL ASSEMBLY	F9701	79703	N/A	FLUOROCARBONS	1105	.2	1104
				METHYLENE CHLORIDE	75092	.0025	14.02
ARLINGTON SHOP	F9702	78704	N/A	FLUOROCARBONS	1105	.34	2112
				TOLUENE	108883	.0028	15.43
				XYLENE	1210	.29	1634
1,1,1 TCA STORAGE TANK	F9901	79901	D23563	1,1,1 TCA	71556	.066	399.4
GASOLINE STORAGE TANKS	F9902	79902	M94613	GASOLINE VAPORS	1110	.11	640.34

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COOLING TOWER/AIR COND	F9903	79903	N/A	CHLORINE	7782505	.005	43.8
				BROMINE	7726956	.007	68.7
				SODIUM HYDROXIDE	1310732	.028	244.5
COOLING TOWER/COMPRESSOR	F9904	79904	N/A	CHLORINE	7782505	.0012	10.6
				BROMINE	7726956	.002	16.6
				SODIUM HYDROXIDE	1310732	.028	244.5
COOLING TOWER/AIR PROD	F9905	79905	N/A	CHLORINE	7782505	.00028	2.5
				BROMINE	7726956	.00045	4
				SODIUM HYDROXIDE	1310732	.0016	14.2
COOLING TOWER- ACLAIM 1/3	F9906	79906	N/A	CHLORINE	7782505	.00028	2.5
				BROMINE	7726956	.00045	4
				SODIUM HYDROXIDE	1310732	.0016	14.2

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PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
COOLING TOWER ACTIVITY/2	F9907	79907	N/A	CHLORINE	7782505	.00028	2.5
				BROMINE	7726956	.00045	4
				SODIUM HYDROXIDE	1310732	.0016	14.2
COOLING TOWER ACTIVITY/4	F9908	79908	N/A	CHLORINE	7782505	.00043	3.8
				BROMINE	7726956	.00068	6
				SODIUM HYDROXIDE	1310732	.002	21.2
COOLING TOWER ACTIVITY/5	F9909	79909	N/A	CHLORINE	7782505	.00062	5.5
				BROMINE	7726956	.00098	8.6
				SODIUM HYDROXIDE	1310132	.0035	30.7
COOLING TOWER ACTIVITY/8	F9910	79910	N/A	CHLORINE	7782505	.0002	1.9
				BROMINE	7726956	.00033	2.9
				SODIUM HYDROXIDE	1310732	.0011	10.4

REVIEW ENGINEER _____

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/
COOLING TOWER ACLAVE/9	F9911	79911	N/A	CHLORINE	7782505	.0002	1.9
				BROMINE	7726956	.00033	2.9
				SODIUM HYDROXIDE	1310732	.0011	10.4
COOLING TOWER ACLAVE 10 - TITAN	F9912	79912	N/A	CHLORINE	7782505	.00043	3.8
				BROMINE	7726956	.00068	6
				SODIUM HYDROXIDE	1310732	.002	21.2
COOLING TOWER BLDG 5 ACLAVE	F9913	79913	N/A	CHLORINE	7782505	.00026	2.3
				BROMINE	7726956	.0004	3.7
				SODIUM HYDROXIDE	1310732	.001	13.1
COOLING TOWER CAFETERIA	F9914	79914	N/A	CHLORINE	7782505	.00043	3.8
				BROMINE	7726956	.00068	6
				SODIUM HYDROXIDE	1310732	.002	21.2

REVIEW ENGINEER _____

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
COOLING TOWER PRECOOLER 1	F9915	79915	N/A	CHLORINE	7782505	4.5E-5	.4
				BROMINE	7726956	6.8E-5	.6
				SODIUM HYDROXIDE	1310732	.0002	2.1
COOLING TOWER PRECOOLER 2	F9916	79916	N/A	CHLORINE	7782505	4.5E-5	.4
				BROMINE	7726956	6.8E-5	.6
				SODIUM HYDROXIDE	1310732	.0002	2.1
TITAN HYDROCLAVE	F9917	79917	N/A	CHLORINE	7782505	4.5E-5	.4
				BROMINE	7726956	6.8E-5	.6
				SODIUM HYDROXIDE	1310732	.0002	2.1
COOLING TOWER #1 B 55	F9918	79918	N/A	CHLORINE	7782505	.0005	4.9
				BROMINE	7726956	.0008	7.8
				SODIUM HYDROXIDE	1310732	.003	27.6

REVIEW ENGINEER _____

PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

AQMD ID# 800113

Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
COOLING TOWER #2 B55	F9919	79919	N/A	CHLORINE	7782505	.0005	4.9
				BROMINE	7726956	.0018	7.8
				SODIUM HYDROXIDE	1310732	.003	27.6
COOLING TOWER #3 B 55	F9920	79920	N/A	CHLORINE	7782505	.0005	4.9
				BROMINE	7726956	.0008	7.8
				SODIUM HYDROXIDE	1310732	.003	27.6
COOLING TOWER #4 B 55	F9921	79921	N/A	CHLORINE	7782505	.0005	4.9
				BROMINE	7726956	.0008	7.8
				SODIUM HYDROXIDE	1310732	.003	27.6
COOLING TOWER A/C B 55	F9922	79922	N/A	CHLORINE	7782505	.0001	1.3
				BROMINE	7726956	.00022	2
				SODIUM HYDROXIDE	1310732	.0008	7.1

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PROCESS, DEVICE, AND EMISSION DETAIL

COMPANY NAME ROHR INDUSTRIES, INC.

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Process/Device Information				Emission Information			
Process/Device Description	Emission Point ID #	Device ID #	P/N or A/N	Pollutant Name	Pollutant CAS #	Hourly Maximum (lbs/hr)	Annual Average (lbs/yr)
COOLING TOWER BLDG 4	F9923	79923	N/A	CHLORINE	7782505	.0002	2.1
				BROMINE	7726956	.00037	3.3
				SODIUM HYDROXIDE	1310732	.0011	11.8
TRIPLE EFFECT COOLING TOWER	F9924	79924	N/A	CHLORINE	7782505	3.4E-5	.3
				BROMINE	7726956	.00045	.4
				SODIUM HYDROXIDE	1310732	.00016	1.4
BUILDING 20 COOLING TOWER	F9925	79925	N/A	CHLORINE	7782505	.0001	1
				BROMINE	7726956	.0001	1.6
				SODIUM HYDROXIDE	1310732	.0006	5.7

REVIEW ENGINEER _____

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